June, 1941

NINTH ANNUAL
CONVENTION-IN-PRINT

50c a Copy

ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS

BOOST Summer Profits WITH EVAPORATIVE COOLERS

Sleep Cool
Install an ELECTRIC EVAPORATIVE Comfort COOLER
Leave the Heat Outside!
Install an ELECTRIC EVAPORATIVE Comfort COOLER
SLEEP COOL...EAT COOL...WORK COOL
SOUTHERN CALIFORNIA EDISON COMPANY LTD.
Come in out of the Heat!
Install an ELECTRIC EVAPORATIVE Comfort COOLER
SLEEP COOL...EAT COOL...WORK COOL
CALIFORNIA EDISON COMPANY LTD.
This Summer, DON'T SWELTER!
Install an ELECTRIC EVAPORATIVE Comfort COOLER
WORK COOL
SLEEP COOL
EAT COOL
SOUTHERN CALIFORNIA EDISON COMPANY LTD.

It's comfort cooling time again! In a few short years, the electric evaporative cooler has established itself as a big-profit appliance. It's a boon to overheated Californians . . . and a bigger boon to alert appliance dealers. This year the full weight of Edison advertising will again be thrown behind electric evaporative cooler promotion. Starting in May, a big direct mail campaign and large-space newspaper advertisements wi.. tell thousands of Southern and Central Californians about comfort cooling. Cash in on this Edison advertising . . . use it to boost your summer profits with electric evaporative coolers.

6-41

SOUTHERN CALIFORNIA Edison

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), June, 1941. Vol. 86, No. 6. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shillings). Single copy 25c.
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HERE is a cable for use where bare wire won . .o— where tree trimming would cost too much and where the right-of-way would be hard to obtain if other types were used. It can cut costs, as the 500,000 feet now in service have proved. Most of this footage is two-conductor, and experience with it has led our engineers to add two new classifications. These open up new places where this unique cable can lower the cost of installation and maintenance, improve regulation, better service, and add to safety.

What SS Cable Is

The feature of SS cable is its outer covering. Steel wires, for mechanical strength to make the cable self-supporting, are interwound with copper conducting wires. The complete line now available includes two-, four-, and multiple-conductor.

Where It Can Reduce Costs

Type SS cable is advantageous for use on urban, suburban, and rural power circuits in place of bare, weatherproof tree wire, or cable on messengers.

The two-conductor type is for single-phase circuits with one side grounded, from 4000 up to 15,000 volts.

The four-conductor type is for three-phase four-wire circuits with grounded neutral, up to 5000 volts. Each is insulated with No. 1799 varnished-cambric; the ground-return conductor is in the outer covering.

The multiple-conductor type is used for telephone, supervisory, and other control circuits. The most general size is No. 16 Awg stranded, ranging from four to ten conductors. The insulation is Thinwol rubber. The interwound armor on this cable is used only for suspension and mechanical protection.

Our new bulletin, GEA-2408A, gives more facts. For a copy address the nearest G-E office or General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

501-1-1:200

Here in the WEST

People

Authors
of this month's adequate wiring article are the prize winners of the PCEA "Richard E. Smith" Memorial essay contest, seven of whom were gathered together at the PCEA convention at Coronado for their picture. Seated are MaBelle Smith, PG and E, San Jose; Mary Shoop and Hazel Stirneman, Edison Co., Los Angeles and Redlands. Standing are T. E. Cooke, Edison, Pomona; Jack Martin, PG and E, Stockton; H. J. Moore, PG and E, Sacramento, and W. T. German, Edison, Whittier. "What they say about Wiring" you'll find on p. 66. What others said in their papers will be extracted for future publication.

Jim Lightbody
is a modest Scotch-Canadian whose official title, publicity manager, is as free of frills as a Scot would wish it. It gives no hint of the wit and human friendliness that goes into Lightbody's opus, "The Buzzer," a weekly pick-up folder read, yes truly read and relished, by 41,000 car riders of B. C. Electric Railway each week. Active in the company's sales program advertising he knows what the war has done to business, p. 61.

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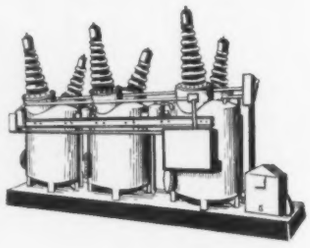
Cover—Vigilant watch of the night sky is practiced by a Canadian searchlight battery using latest equipment. B. C. Electric Railway Co. photo.

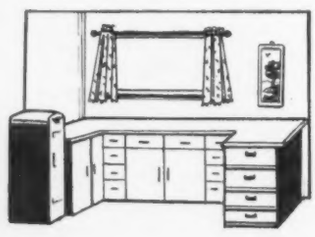
Preview

War Wiring
in the defense industry plants calls for careful design to insure uninterrupted service no matter what happens. L. O. Trim, electrical inspector of Burbank, where airplane factories grow bigger and better, has written for next month a paper on the electrical facilities at such industries. It treats of basic design and hence is applicable to any such plant being built or planned for the future. In fact, it is good stuff for any factory, war baby or not. Safe and adequate wiring proves to be most efficient and least costly in the long operation.



OCB
stands for oil circuit breaker, and such breakers stand for a lot. On today's heavy loads they are good soldiers. Better operation, however, is always being sought. A Northwest Electric Light & Power Assn. report on fuse and relay coordination for circuit breaker tripping will be prominent among the engineering articles in July.

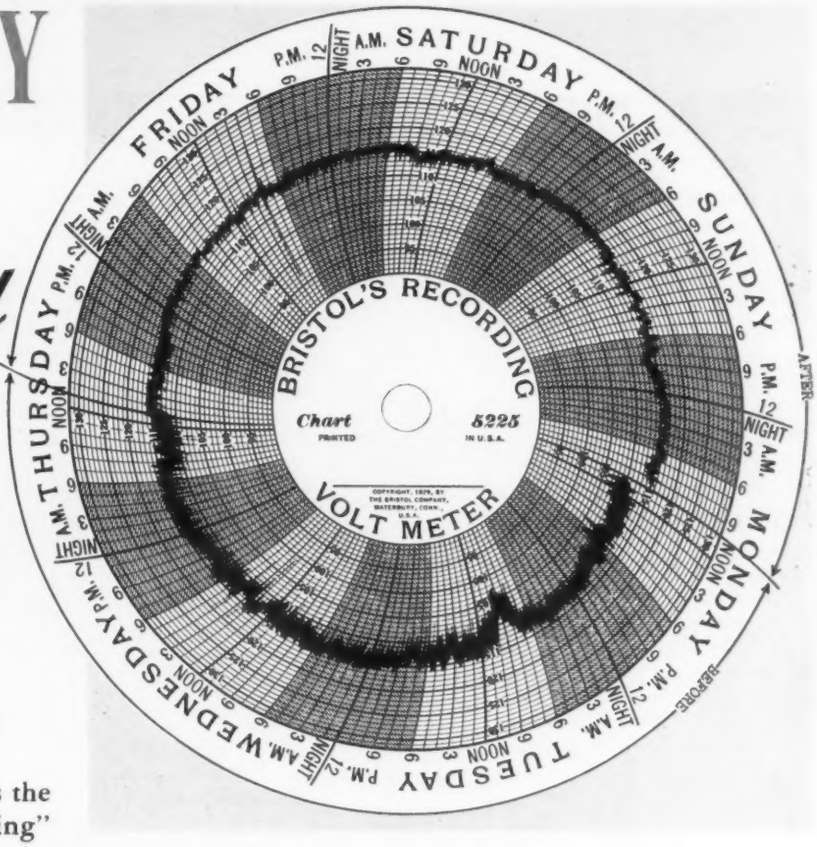
Fluorescent
trouble shooting requires a practical everyday sort of technique for the practical everyday electrician and electrical contractor who does most of the servicing. In preparation is just such a practical article with suggested field test equipment. Perhaps it will be ready for July, certainly by the August issue.



Kitchens
will be the subject of the Sales Guide next time. There's a real trend toward the complete kitchen and now packaged sections of kitchen centers make them a real merchandising opportunity for dealers and their salesmen

SECONDARY FUSING

for Improved Voltage Regulation



This chart was made on the secondary mains of a utility company over a period of one week. Between one and two p.m. on Thursday, several adjacent sections of secondary were "banked." The recording continued without interruption until the following Monday morning. Note the marked improvement in regulation which resulted from the banking.

★ Let's See What the Records Show

The voltmeter chart shows the poor regulation before "banking" of secondary mains—while at the left,—beginning at about 2 P. M. Thursday—the marked improvement in voltage regulation is clearly indicated.

Three sizes of S & C Indicating Secondary Links. Construction is weatherproof. Ampere ratings are clearly stamped.

Besides this obvious improvement in voltage regulation gained through the use of S & C Secondary Cutouts for interconnecting or "banking" secondaries—transformer capacity is used more effectively.

A greater degree of protection is provided against transformer failure due to excessive peak loads or high impedance faults on the secondary circuits . . . And in radial service connections S & C Secondary Fusing protects against overloading on customers' premises.

S & C Secondary Fuses have a positive indicating device which is readily detected from the ground, and a weatherproof construction in which the internal working parts are totally enclosed before and after blowing.

Secondary fusing is discussed in Bulletins 215-C and 218-A. Copies will be mailed on request.

SCHWEITZER & CONRAD, INC.

4435 Ravenswood Ave., Chicago, Ill.

***Manufactured in Canada* by Powerlite Devices, Ltd., Toronto, Ontario**

SECONDARY FUSE LINKS

WESTERN REPRESENTATIVES:

SAN FRANCISCO
George E. Honn, 420 Market Street

LOS ANGELES
Farnham & Cunningham, Edison Bldg.

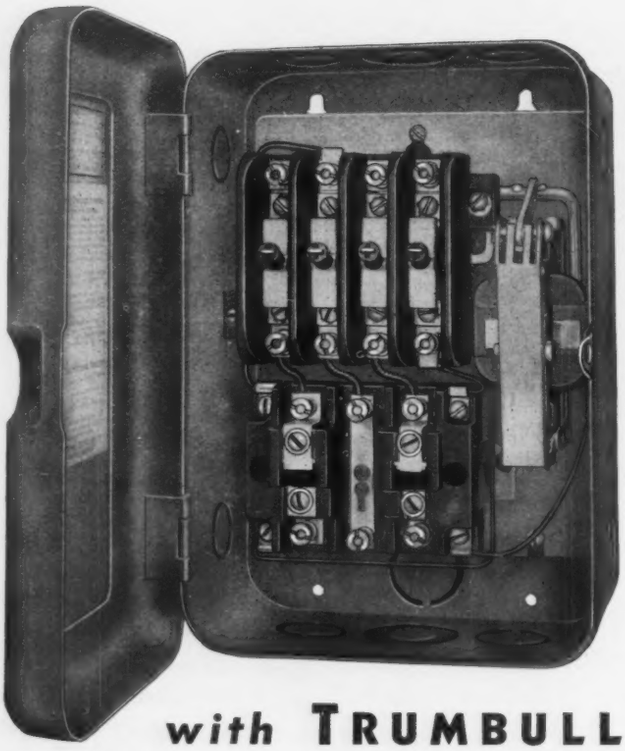
SEATTLE
T. S. Wood, 220 Ninth Avenue, North

SALT LAKE CITY
Riter Engineering Co., Kearns Bldg.

TRUMBULL

PUSH BUTTON

Symbol of ACTION



with TRUMBULL

MAGNETIC STARTERS

. . . action controls for modern action machines . . . Now is the time to check motor controls not only for motion-saving convenience that speeds machine operation, but for cost and time-saving protection to machines under heavy production loads . . . and for the modern Trumbull features such as vertical, dust free contacts, removable unit interiors, interchangeable relay heaters, and all parts removable from front, that assure faultless 24-hour-a-day operation.

A broad range of sizes and capacities in Starters, Contactors, Combinations and Reversing Controllers. Get Trumbullaid Bulletin 404.

ESTABLISHED 1899

THE TRUMBULL ELEC. MFG. CO.

PLAINVILLE CONN. U.S.A.

A GENERAL ELECTRIC ORGANIZATION

KEEP *Alert* ELECTRICALLY use your TRUMBULLAIDS

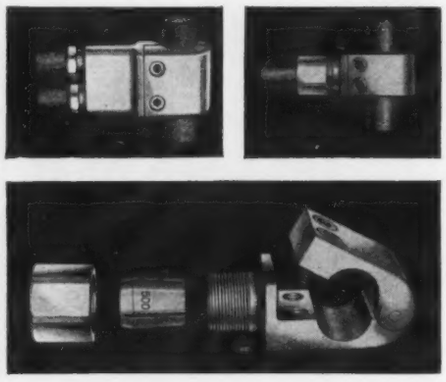
Factories at SEATTLE — SAN FRANCISCO — LOS ANGELES

PRODUCTS

that are news

Hinged Tee (600)

Penn-Union Electric Corp. has produced a hinged tee connector, which the manufacturer claims provides quick installation, combined with an unusually high degree of mechanical and electrical dependability. Hinged clamp simplifies installation, as connections to the main and branch are made independently. The split-cone contact unit assures a permanent grip on the branch, which will not loosen under vibration. A tapered cone, made flexible by slots, clamps tightly on to the branch when compressed by the unit. Contact surfaces for both the main and branch are serrated. The fitting is made in a complete range of sizes, for one or more branch conductors.



Dual Fixture Job (601)

Mitchell Mfg. Co., fluorescent light equipment manufacturers, have available a new 200-watt 4-light shielded fixture which according to the company handles the dual job of general lighting plus localized lighting. The unit comes with canopies for suspension mounting and is also available for surface mounting. Uses four 40-watt fluorescent bulbs. The unit is corrected for high power factor and stroboscopic effect.

Up and Down Light (602)

A new Benjamin fluorescent lighting unit to utilize extra light advantages of the new 60-inch fluorescent lamps and embodying a new Stream-Flo development to provide for ceiling illumination has been announced by Benjamin Electric Mfg. Co. The unit has in addition to standard features, a series of apertures located in the top of the reflector available—directly over each fluorescent lamp. These openings permit approximately 2½% of light output to pass upward to relieve contrast between lighted areas of the room and the ceiling background.

Plastic Snap ons (603)

Recently developed Guth "P-F-C" plastic diffusing strips "snap on" fluorescent lamps to "snap up" fluorescent lighting. The new diffusing strips, in 12" and 24" lengths, are a refinement for any fluorescent lighting installation where 1½" lamps are used in open type fixtures. The diffusing strips reduce lamp

"Streamlined"

O-B Bushings Have Four New Features

New Class L bushings on O-B's busy production line, and a sectioned Class G bushing, showing the redesigned oil reservoir which effects a complete sealing (1), the magnetic oil level indicator (2), the internal porcelain barriers (3), and the interchangeable terminals (4).

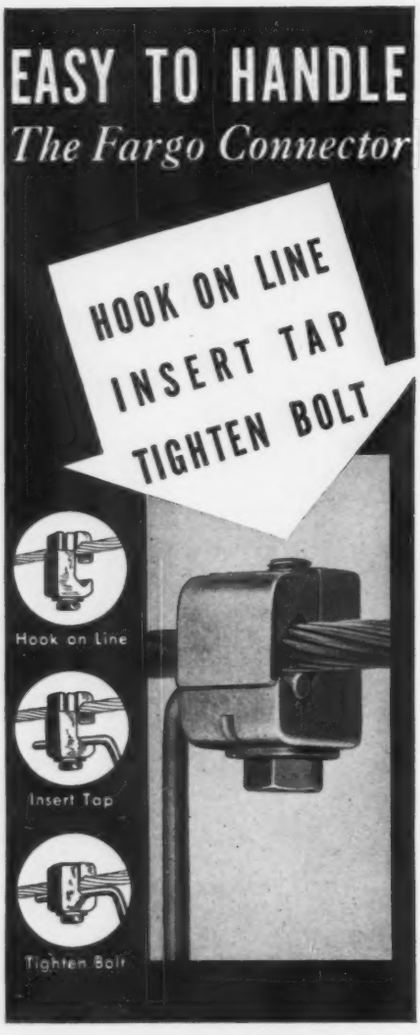
Complete, permanent sealing—a magnetic oil level indicator—more internal porcelain—interchangeable terminals. Four features, all new, and added to O-B's time-proved basic design they make the best bushings still better! The sealed oil expansion chamber prevents breathing of moisture-laden air which might reduce the insulating value of the oil, permits the bushings to be stored or handled in any position without oil loss, and eliminates the need for adding oil at any time. All Class G bushings are provided with the magnetic oil gauge which can be read easily from a considerable distance and which remains readable since oil cannot reach and discolor the dial. More extensive use of internal porcelain increases the factor of safety against puncture and internal over-surface stress, permits better electrical grading, adds to the dielectric stability, and improves the over-all electrical efficiency. And the interchangeable terminal system makes each transformer bushing suitable for many terminal combinations. To get all these ultra-modern features and their advantages, be sure in ordering apparatus to specify Bushings by O-B!

Buy the Best ...Buy O-B

Ohio Brass B

MANSFIELD, OHIO, U. S. A. 2229-H

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont., Canada



You cut out waste motion when you use the Fargo Connector. It's built as one unit, free from loose parts, and *always threaded.* No time lost starting a nut, no chance of cross threading.

Re-use the Fargo Connector, again and again. With its rugged Everdur body and Duronze bolt, the Fargo Connector "grips like a vise" every time.

Made by
FARGO MFG. CO.
Distributed by

LINE MATERIAL CO.
MILWAUKEE, WIS.

brightness 30% yet transmit more light than glass panels. They are made of shatter-proof plastic and are held securely on lamps with strong clamps that easily snap on or off.

Aqua-Fan (604)

W. H. Fabry Mfg. Co. are featuring a new Aqua-Fan with which warm polluted air is drawn in the fan from above and expelled through the side grill, after the air has been cleaned and cooled by passing through a finely atomized spray of clear water. A water spray, according to the manufacturer, thrown out by means of a rotating pump, removes minute particles of dust and smoke from the air. The fan is constructed of rust-proof steel, electrically welded into one integral unit. The

fan is 9 in. in diameter, 12 in. high, and weighs 9 lb., 5 ounces when packed in shipping carton. The unit has built-in rheostat to make speed control possible, and each is equipped with 8 ft. of rubber covered cord and unbreakable rubber plug.

65-Watt Fluorescent (605)

Development of a new 36-inch Mazda F (fluorescent) lamp rated at 65 watts and available in 3500-degree white and daylight was announced by General Electric's lamp department. The new 3-foot lamp is designed to provide lighting designers with a more flexible tool for creating well-styled and efficient commercial luminaires. Like the 100-watt F lamp, the new 65-watt employs a tubular bulb 2⅛" in diameter.

Versatile Sectional Unit (606)

Pittsburgh Reflector Co. now has available luminaires of 40-watt, 48" F lamps in quantities of two, three, four and six; may be in-

RUGGED STRENGTH AND LONG LIFE AT LOW COST

EVERY physical characteristic essential to high strength, long life and trouble-free maintenance is combined —with sound economy—in *Crapo* Galvanized Steel Strand.

The superior tensile properties inherent in steel are used to fullest advantage in this time-proved product. The heavy, ductile, tightly-adherent zinc coatings—applied by the *Crapo* Galvanizing Process—provide lasting protection against corrosion, increase the life of the strand beyond the normal period of replacement. Correctly controlled ductility makes *Crapo* Steel Strand easy to serve. Characteristic ruggedness enables it to withstand the punishment encountered both in construction and in service.

The low first cost and low yearly cost of *Crapo* Galvanized Steel Strand result in important economies to many of America's leading utilities. *Crapo* Galvanized Steel Strand is available in all standard grades and sizes from representative jobbers located in principal distributing centers. Consult the distributor of *Crapo* Galvanized Products near you, or write direct for further information!

Crapo Galvanized Products also include *Crapo* HTC-130 and HTC-80 Steel Conductors (Solid and Stranded 3-Wire), Construction Wire, Tie Wire and Ground Wire.

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

How to get Narrow Band Widths with only 1/3 THE EXCITING CURRENT!

Allis-Chalmers 5/8% Step DFR Regulators Maintain Narrower Band Widths . . . Require 67% Less Wattless Current! Here is One Way You Can Save the Cost of Static Capacitors . . . Release System Capacity for Pay Loads!

You don't have to burden your system with extra wattless current to get narrow band widths.

For the Allis-Chalmers 5/8% Step Regulator holds narrow band widths — as low as ±3/4 volts for some feeders — and does it with *only 1/3 the excitation current required by older types of regulators!*

Let's take a typical case. A public utility needs ten 72 kva, 2400 volt regulators. Their chief engineer finds that he can free his lines of 122 reactive kva if he installs Allis-Chalmers DFRs rather than older type regulators.

That's a total saving of $850 on static capacitors alone* — actually 4% of the regulators' cost! But even if static capacitors aren't used, 55 kva of system capacity will still be released (with 90% power factor loads).

Figure out what savings like this can mean on your lines! And don't forget DFR's narrower band widths . . . reduced losses . . . quieter operation . . . minimum maintenance costs!

Bulletin B-6065 gives complete information on Allis-Chalmers 5/8% Step DFR Regulators. Write for your copy . . . *today!*

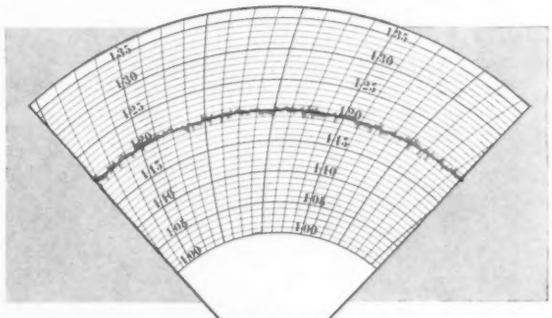
*Average installed cost—$7 per kva.

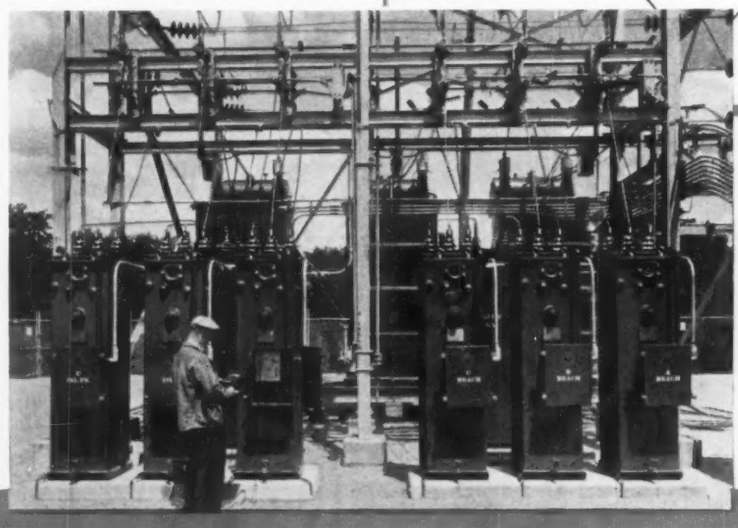
A 1402

5/8% Step Regulators Have Been Holding 2 VOLT BANDS FOR 7 YEARS!

When the Allis-Chalmers 5/8% Step Regulator was designed over eight years ago, the size of steps was selected as 5/8 of 1% because data gathered from utilities all over the country indicated that the 2 volt band was desirable.

Look at the accompanying chart, a typical record obtained under actual service of an Allis-Chalmers DFR. It shows how the voltage is easily held within a 2 volt band.





Northwestern system likes the lower excitation current and closer band widths provided by these six 72 kva, 2400 volt Allis-Chalmers 5/8% Step DFR Regulators.

These 5/8% Step Regulators Are Famous for Better Regulation at Lower Cost! Choose the Regulator to Fit Your Purpose!

DFR — 12 to 250 kva, single phase
AFR — 20.8 to 750 kva, three phase
CFR (air cooled) — 36-96 kva, 2400 volt, single phase

ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

Save 25% . . . in Material and Connecting Time WITH B-M CONNECTORS AND COUPLINGS

Popular, Simple Method

Saves 25% on material, 25% to 50% of connecting time. Makes installations quick and easy. Eliminates complications and ends fussing with nuts to tighten.

Approved by Underwriters Laboratories

Only One Tool Needed!

Costs you only $1.25 for the patented B-M indenter (½" size handles 80% of all installations). Just two squeezes, and you have a smooth, neat connection. No other tools required. This tool can save you many times its cost on the first job.

Strong, Neat Connections

You welcome the speed and ease that the B-M system puts in your hands. These fittings give you complete, WELL FINISHED WORK in a hurry—on all average jobs (they're non water-tight).

Distributed By

The M. B. Austin Co. Chicago, Ill.
Clayton Mark & Co. Evanston, Ill.
Clifton Conduit Co. Jersey City, N. J.
General Electric Co. Bridgeport, Conn.
The Steelduct Co. Youngstown, Ohio
Enameled Metals Pittsburgh, Pa.
National Enameling & Mfg. Co. Pittsburgh, Pa.
Triangle Conduit & Cable Co. Elmhurst, New York City

BRIEGEL METHOD TOOL CO., Galva, Ill.

Use More

DROP FORGED

Pole Line Hardware And Obtain

★

1 Plus Strength in Lighter Sectional Thicknesses.

2 Uniform Physical Structure, Size and Shape.

3 Freedom from Concealed Defects.

4 Extra Margin of Safety.

Forgings offer many direct and indirect economies. Consult makers of drop forged pole line hardware.

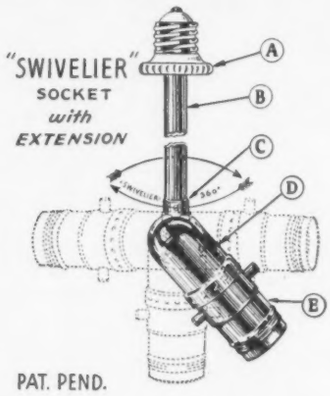
DROP FORGING ASSOCIATION

605 HANNA BUILDING • CLEVELAND, OHIO

stalled surface mounted or suspension mounted and include (as optional equipment) an embossed crystal plastic cover of cylindrical shape to conceal lamps and minimize glare. A basic design idea: each luminaire consists of two or more specially designed trough reflectors of pretested efficiency permanently joined adjacently into a one-piece housing.

Swivelier (607)

Reliance Devices Co. has available a Swivelier for a wide range of socket adaptations in industrial plants, store lighting and building and display lighting. Features of the Swivelier tube include: End of rod available with box plate, screw-in adapter, or can be threaded to attach to another arm or object. Several advantages of the rod attached socket are that it can be adjusted vertically to full



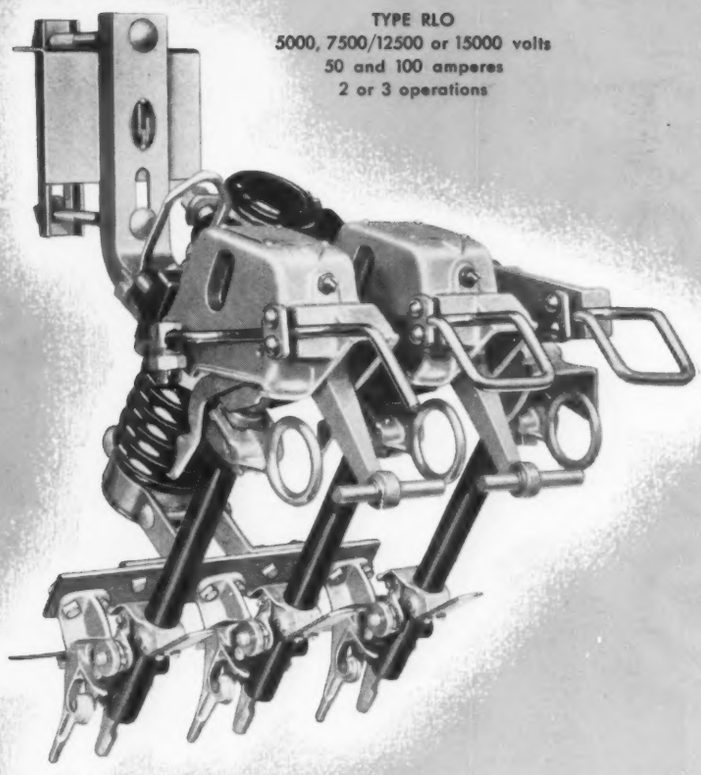
90 deg. right angle, can be rotated in 360 deg. vircle, nipple construction permits attaching to rod or lamp arm, and the unit will stay put in any position, inside spring compensates for wear due to friction. The unit comes in choice of electrolier mechanisms—push-through, turn-knob, three-way light, porcelain keyless.

4-in-1 Gift (608)

A 4-in-one gift, designed especially for June brides was introduced by General Electric Co., heating device section, Bridgeport. "Honeymoon special" is the name of the combination offer, which includes a General Electric automatic glass coffee maker, an automatic speed iron and an Expan-dor toaster packed in a trousseau case. List price of this combination is $29.95.

TYPE RP2-56
5000 volts, 50 amperes
2 operations

TYPE RLO
5000, 7500/12500 or 15000 volts
50 and 100 amperes
2 or 3 operations



for service continuity, reduced outages

L-M RECLOSING FUSE CUTOUTS ARE THE ECONOMICAL SOLUTION

Where service continuity is concerned, the right reclosing fuse cutout at strategic points on the line offers the economical solution.

L-M Reclosing cutouts have for years proved their reliability in giving economical protection. They are built for dependable service. They are easily installed, readily coordinated with other protective equipment.

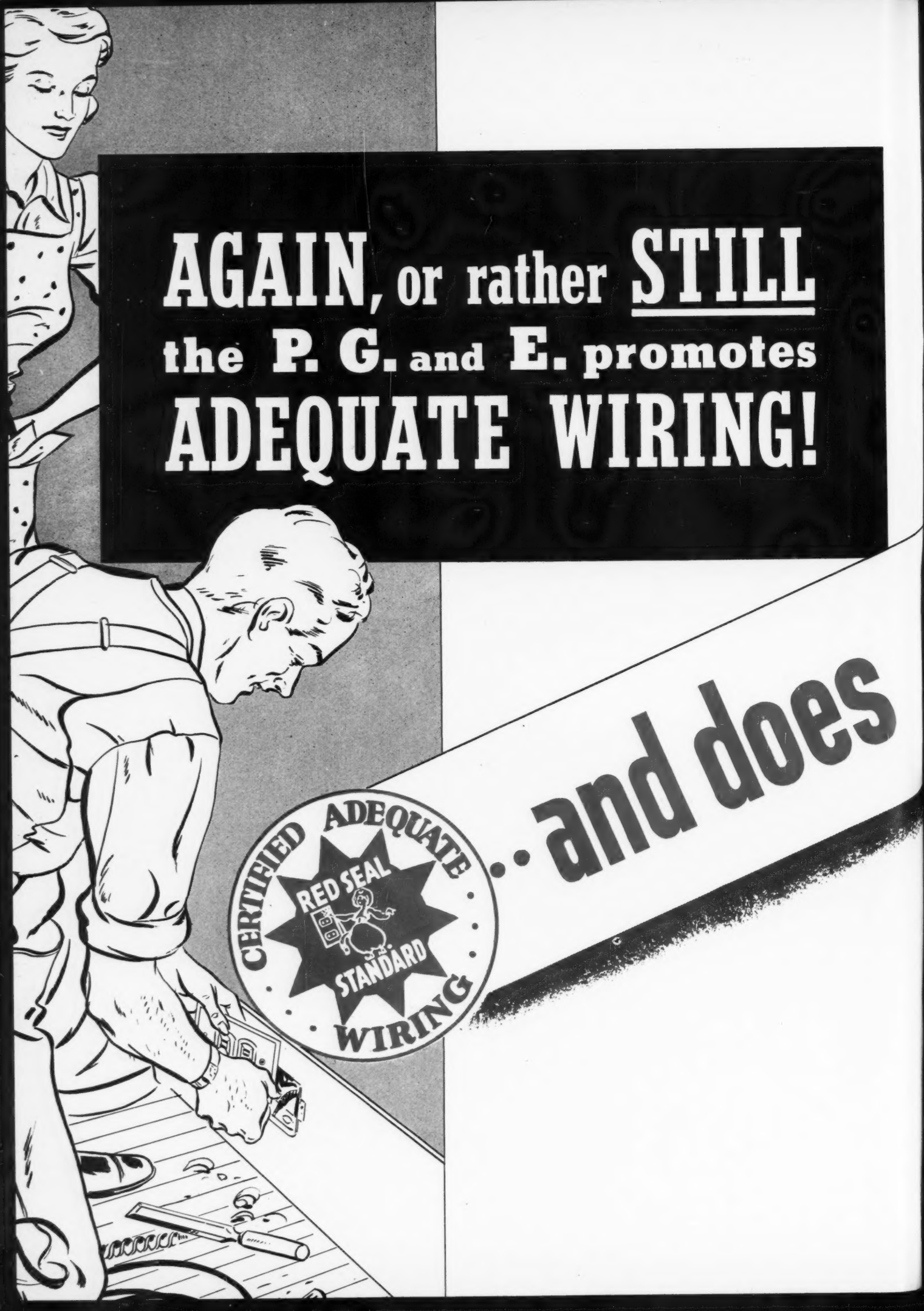
All L-M Reclosing Cutouts feature time-delay mechanisms. L-M was first with this valuable feature that reduces the chance of unnecessary fuse link blowings.

All L-M Reclosing Cutouts have only two operating positions of the cartridges, IN or OUT; there are no levers to pull, no auxiliary mechanisms to cock. Cartridges can be replaced in any sequence without momentary service interruptions.

There is the right L-M reclosing cutout for any service requirement. Your L-M representative will be glad to suggest the one best suited for your job or write for complete technical information to Line Material Company, Milwaukee, Wisconsin.

LM

LINE MATERIAL COMPANY


AGAIN, or rather STILL
the P. G. and E. promotes
ADEQUATE WIRING!
CERTIFIED ADEQUATE
RED SEAL
STANDARD
WIRING
...and does

EVERY YEAR—SEVERAL TIMES A YEAR—P. G. & E. DEVOTES VALUABLE ADVERTISING SPACE IN NEWSPAPERS AND ON BILLBOARDS AND IN OTHER SELECTED MEDIA TO THE PROMOTION OF CERTIFIED ADEQUATE RED SEAL WIRING. OUR SPRING SCHEDULE THIS YEAR CALLS FOR 3 NEWSPAPER ADVERTISEMENTS, 218 OUTDOOR POSTERBOARDS, 909 TRUCK BANNERS, 18 WINDOW DISPLAYS, AND 351,000 COLORED BILLSTICKERS —A TOTAL INVESTMENT OF $15,061.00 EXCLUSIVE OF DEALER PARTICIPATION

33% 30%

INCREASE IN RED SEAL INSTALLATIONS LAST YEAR AS COMPARED WITH 1939

MORE FOR THE FIRST FOUR MONTHS OF 1941

No question about it!—the persistency of the effort put forth by the Electrical Bureau, the P. G. and E., and other firms and organizations to sell *adequate wiring* IS producing results! We see it in the substantial increases in Red Seal installations. We see it in the increased sale of such key appliances as electric ranges and water heaters. But most of all, we see it in the virtually immeasurable aggregate of material sales, wiring contractor business, appliance and equipment business, increased jobs for labor, increased electric usage—and last but not least, in the increased comfort and convenience and all-around satisfaction that accrues to the user. It all shows very definitely that the adequate wiring story is a purely self-interest story, for everyone concerned—which is why it is succeeding, and why it will succeed still more if we keep on the pressure. Let's be sure we know ourselves what it is (and how it differs from inferior wiring), and even more important, *what it does!* Let's follow the national slogan and KNOW IT! TALK IT! SELL IT! *at every opportunity!*

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

The MOST COMPLETE LINE OF Terminal Lugs

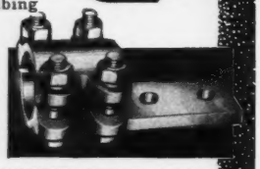
THOUSANDS of patterns — you can find the exact lug you want.

Penn-Union E-Z Lugs take a wide range of conductor sizes. Only 5 sizes of lugs for wire and cable from No. 6 to 1,000,000 CM. Self-locking; positive. Re-used over and over.

QUICK, SIMPLE INSTALLATION with the popular Penn - Union VI-TITE lug. Vise-like action gives a sure grip. Made in a wide range of sizes.

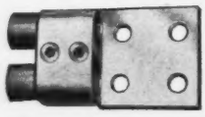
Fully approved *Soldering Lugs*, pressed from pure seamless copper tubing, and annealed. Also cast Heavy-Duty Soldering Terminals—and shrink fit lugs for copper tubing

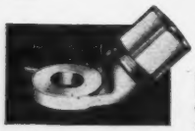
CLAMP TYPE terminals in widest variety. Straight or angle, for cable or tubing, with any desired contact tongue.



SCREW TYPE Solderless, easy to use and universally popular, especially in the small sizes. For both solid and stranded wires.

MULTIPLE CABLE terminals. We can furnish any style lug for two or more conductors.





SLEEVE TYPE terminals, with split contact sleeves, preferred by many large users. Made in many types.

See the Penn-Union Catalog for any kind of Terminal Lug — carefully made, thoroughly tested, *Dependable.*

Also the most complete line of Cable Taps, Service Connectors, Ground Clamps, Two-Ways, Tees, etc.

NORTHWESTERN AGENCIES
2411 First Ave., Seattle, Washington
KENNETH ANDERSON CO.
1855 Industrial Street, Los Angeles
NICHOLAS & COOK
1063 Howard Street, San Francisco
Penn-Union Electric Corp., Erie, Pa.

PENN-UNION
Conductor Fittings

Norge Range Line (609)

"1942" Norge range line comprises 3 models and 3 prices. Particularly noteworthy in the new models is the Norge six-speed switch, which affords accurate six-stage heat control and provides more than adequate heat gradations for every cooking operation from simmering to speed-cooking. Another feature of the Norge line is a circuit-selector switch and clock for automatic timing of either oven, thrift cooker or outlet. Either TK or chromalox top units are available.

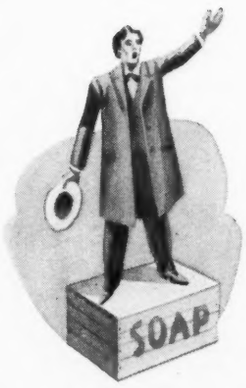
Breakage Reduction (610)

To reduce breakage of suspension insulators on lower-voltage lines, the Ohio Brass Co. has introduced three small-diameter units with a smooth under surface and heavy porcelain sections. Being free of the deep petticoats located on the under side of standard suspension insulator discs, these units allow bullets to ricochet off the surface without causing damage in most cases. The greater impact resistance of the heavier-sectioned porcelain helps reduce breakage from rock throwing, falling objects, and rough handling during shipment and installation. Elimination of petticoats lowers the electrical flashover values only slightly. The three insulators include a 6-in., 10,000-lb. unit with clevis cap and eye pin, and two 7½-in., 15,000-lb. units, one with socket cap and ball pin, and one with clevis cap and clevis pin.

Spirakore Desikn (611)

A new line of outdoor current transformers embodying the Spirakore design, is announced by General Electric, Meter and Instrument division. Recently made available in distribution transformers in single-phase ratings up to and including 500 kva., the Spirakore design marked a progressive change in transformer construction. The new outdoor current transformers are rated 23 and 34.5 kva. Weight of the new units has been reduced 10% in the 23 kva. rating and 16% in the 34.5 kva. rating. Both units are 3 in. smaller in diameter, and the 34.5 kva. transformer is also 3 in. lower than the previous model.

EVERSTICK ANCHORS...
Provide dependable anchoring when poles are subjected to unusual strains from storms. Made of tough, certified, rust resistant, malleable iron for extra strength and holding power.
Write for new bulletin
EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

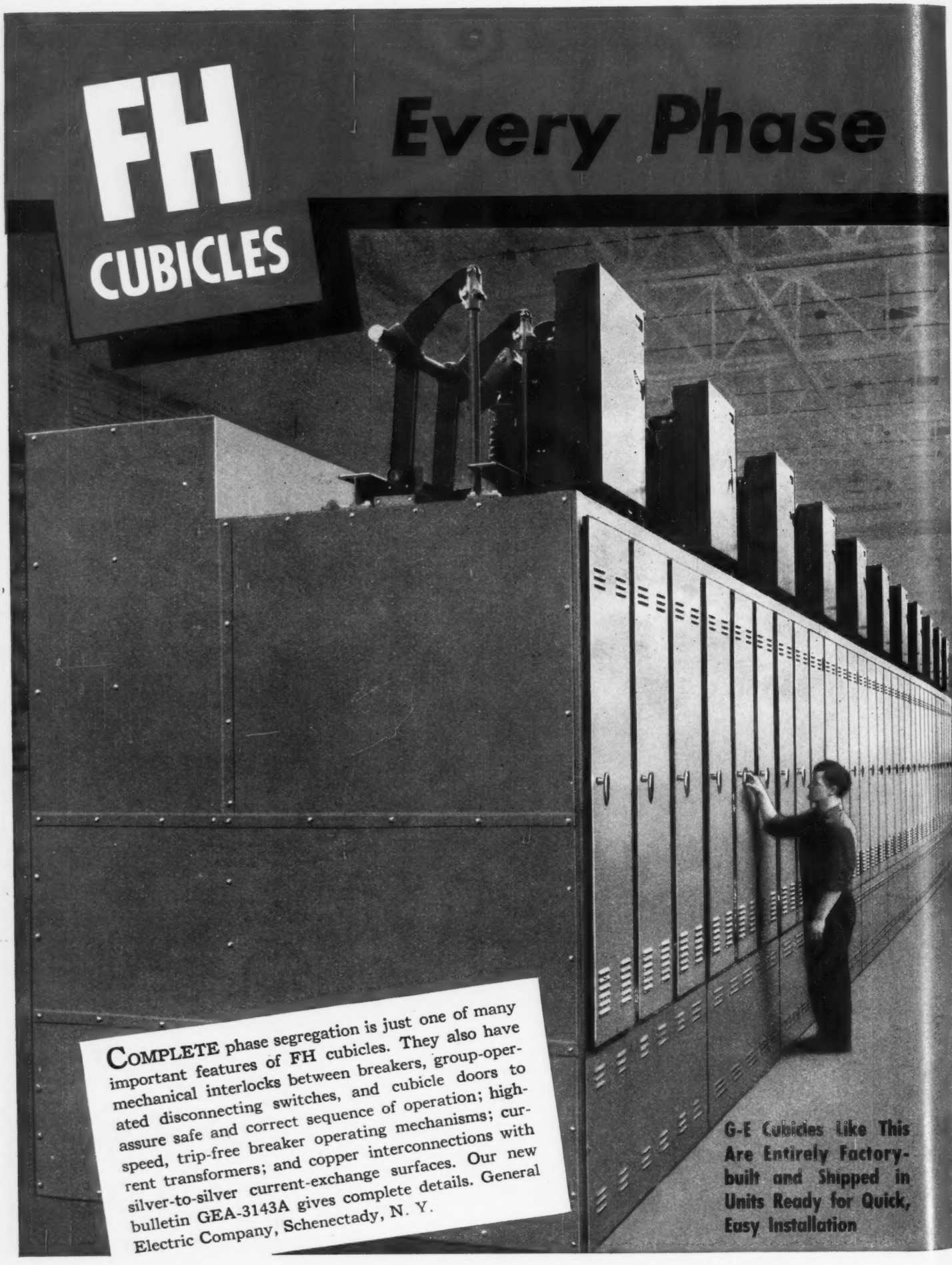


When we know a way to build a high-voltage insulator that will give better operating service, we'll crusade for its acceptance. Meanwhile, we stand on the ten-year record of the Post design, and the testimony of hundreds of operating engineers, "No other insulator ever approached it in performance."

Lapp

LAPP INSULATOR COMPANY, INCORPORATED • LE ROY, N. Y.

FH CUBICLES Every Phase

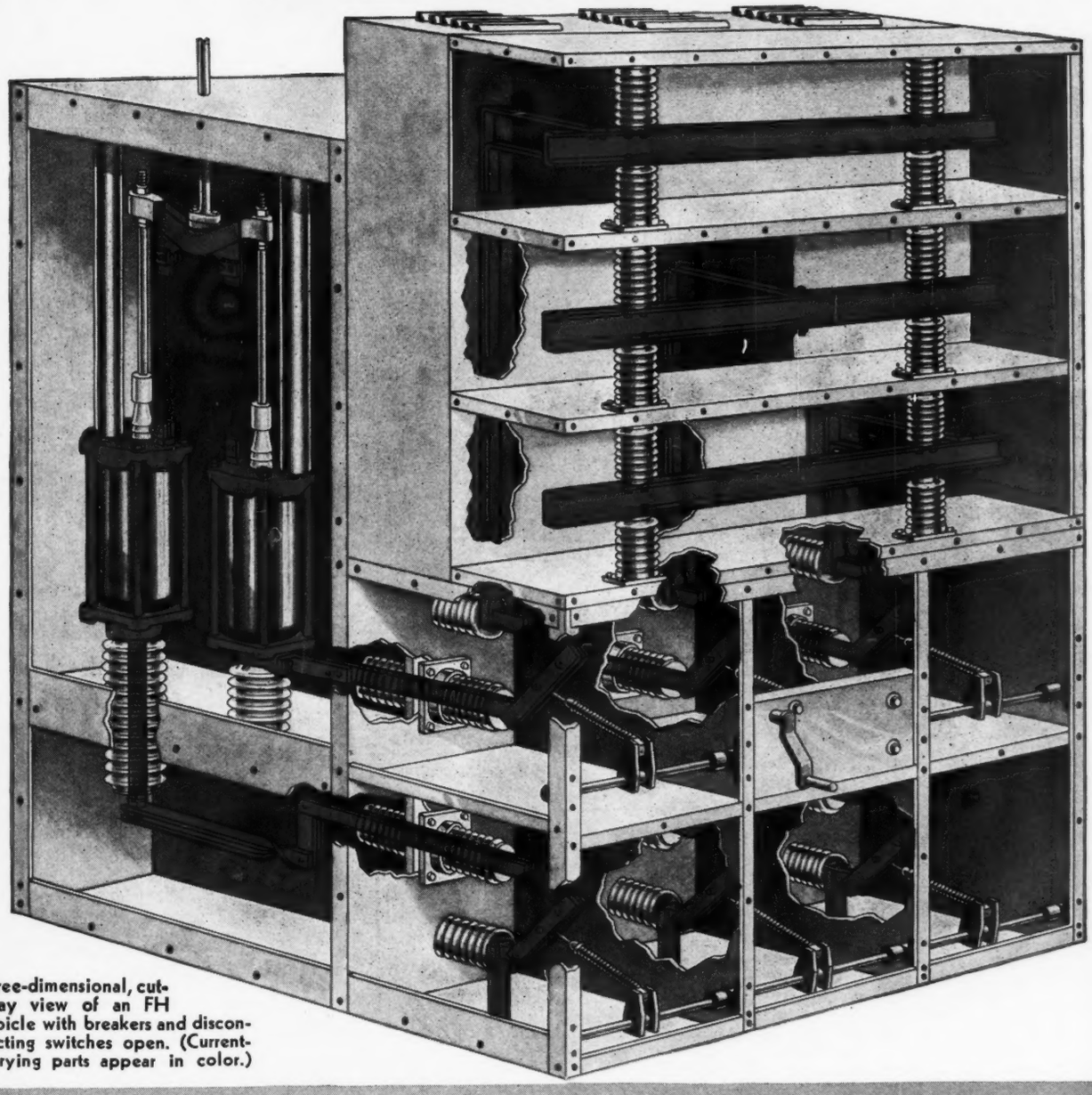


COMPLETE phase segregation is just one of many important features of FH cubicles. They also have mechanical interlocks between breakers, group-operated disconnecting switches, and cubicle doors to assure safe and correct sequence of operation; high-speed, trip-free breaker operating mechanisms; current transformers; and copper interconnections with silver-to-silver current-exchange surfaces. Our new bulletin GEA-3143A gives complete details. General Electric Company, Schenectady, N. Y.

G-E Cubicles Like This Are Entirely Factory-built and Shipped in Units Ready for Quick, Easy Installation

Is Wrapped in Steel

Breakers, Disconnecting Switches, and Buses Are Completely Segregated
NO LIVE PARTS ARE EXPOSED



Three-dimensional, cut-away view of an FH cubicle with breakers and disconnecting switches open. (Current-carrying parts appear in color.)

GENERAL ELECTRIC

855-9-7300

LOOK AT ALL THOSE SWELL SALES FEATURES PLUS THE ADVANTAGES OF LINE-O-LAMPS FLEXIBILITY!
WIREMOLD'S
NEW
DELUXE
Glass Enclosed
LINE-O-LAMPS
LIGHT APPEAL
High illumination on lighted surfaces, excellent distribution. Opal glass transmits maximum light without glare.
EYE APPEAL
Modern architecturally correct design. Translucent opal reeded glass. Aluminum finish.
SIMPLICITY APPEAL
Easy to install, easy to clean, easy to re-lamp. No channeling of ceilings needed.
UTILITY APPEAL
Can be used against ceiling, hung from canopies, mounted on walls, in stores, offices, theaters, clubs, public buildings.
plus CONTRACTOR APPEAL . . .
the same basic No. 3000 Wiremold channel, fittings, controls and other equipment used in all LINE-O-LAMPS are used in the New Glass Enclosed Units.
Hence you have complete FLEXIBILITY in layout and installation to meet every demand . . . from a single lamp unit to multiple continuous run installations in large areas. And bear this in mind . . . you work with time-tested, correctly engineered, standard Wiremold Units and parts with which you are thoroughly familiar.
Wiremold engineers . . . Pioneers in the field of Fluorescent Lighting . . . help you assure your customers the best in service and satisfaction. Write at once for advance copy of New Catalog Section now on the press.
THE WIREMOLD COMPANY, HARTFORD, CONN.
Enjoy the Double Advantage of FLUORESCENT and WIREMOLD

Wiremold Units (612)

Wiremold Co. has added several units to its general electrical equipment line. Among the items are a single-pole switch for control of one or more outlets of a Plugmold multi-outlet system, fluorescent showcase reflector spacers with knockouts for FS switches which are designed to fill gaps between reflectors and thus provide continuous reflection and narrow and deep type junction boxes with ⅜-in. queeze connector, designed for telephone work in conjunction with Wiremold "Pancake" Overfloor raceway.

Fibre Glass Tape (613)

Industrial Tape Corp. has developed a fibre glass adhesive tape with a pressure-sensitive coating. The woven glass textile backing is similar to that developed by the glass companies and finds increasing use in many electrical industries. The tape is manufactured in rolls in the full width of 40 in. and then cut into desired widths.

Fine Line Etcher (614)

A small etcher for permanently marking small tools and parts has been placed on the market by the Ideal Commutator Dresser Co. The etcher writes with a fine line, burning the mark, identification number or name right into the metal. Complete unit includes 9-ft. primary lead and plug, 2-oz. heat resisting hand piece with 3-ft. lead, 4x6-in. work plate, 115-volt, 50-60 cycle standard. Other voltages and frequencies are available.

Splashproof Induction otors (615)

A line of tri-clad splashproof, ball-bearing, polyphase induction motors in sizes from 1 to 15 hp. has been announced by General Electric Co. to supplement its recently announced Tri-Clad polyphase and single-phase open general-purpose lines. The new line is especially designed to meet the needs of applications where splashing water and other liquids are present. Since winding materials and treatment are of particular importance in splashproof motors, the windings are of Formex, G-E's heat- and solvent-resistant magnet wire, carefully wound and impregnated with a special synthetic resin varnish.

Cedar Pole Treatment (616)

Full-length, toxic treatment for cedar poles which inhibits sapwood decay by killing off attacking organisms has been developed by the Consolidated Treating Co. According to the company, the new development represents a material advance in pole preservation since the introduction of the incised-process butt treatment.

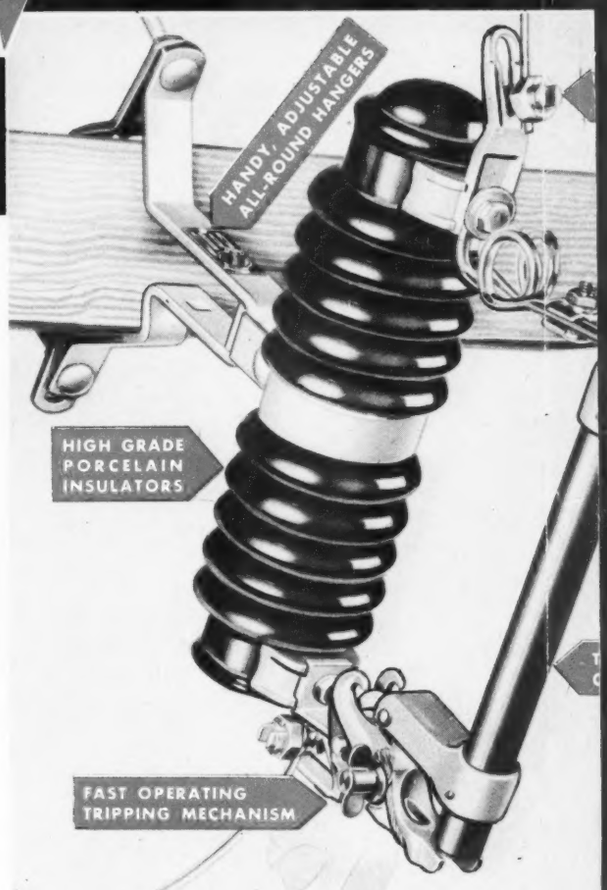
New Type Regulator (617)

Allis-Chalmers Mfg. Co. announces a completely new type air-cooled regulator for feeder voltage regulation, available in ratings of 36 kva. to 96 kva., 2,400 volts, single phase. This new unit embodies the same inherent advantages of low exciting current, low losses and fine regulation that have made the oil-filled type of regulator so popular. The regulator is of the step type having thirty two ⅝% steps to provide 10% regulation. The transformer is completely air-cooled without blowers or forced ventilation, and the tap changer operates in air without lubrication.

99.9+%

of One Company's 35,000 KEARNEY TRIP OUTS in Service for 5 YEARS

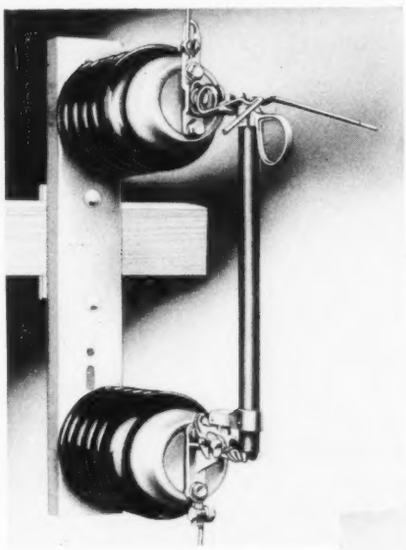
Here's PR



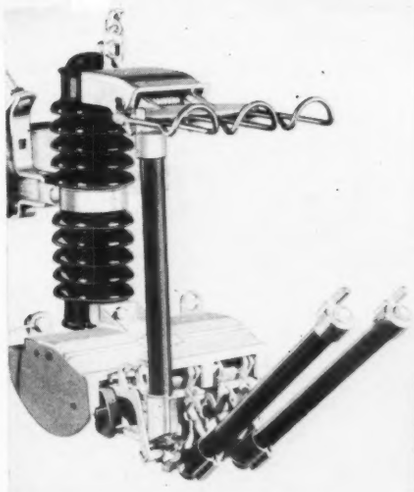
SERIES B TRIP OUT. 15,000 V., 100 Amp. — before and after

RATINGS

Kearney Trip Outs of various designs are available in ratings of — 5000–15,000 volts, 100 amperes, or less; 7500/12,500 Y Grd.–69,000 volts, 100 and 200 amperes — a wide choice to meet your needs.



Higher voltage Kearney Trip Outs, above, are mounted on channel bases; ratings of: 7500/12,500 Y volt—69,000 volts, 100 and 200 amperes.



For extra protection—Kearney Repeating Trip Outs (Kearney Trip Savers), at right. Designed to operate in a handy left-to-right cycle of operation. Ratings: 5000 volts — 69,000 volts; 100 ampere.

Get the Most out of Your Switches . . . Use-

KEARNEY TYPE 200 FITALL FUSE LINKS

For efficient, dependable operation of your fuse switches you need modern, precision built Kearney Type 200 Fitall Fuse Links—to safeguard overload capacity, to preserve uniformity—to actually obtain the sort of dependable protection that gives you maximum continuity of service in face of today's urgent requirements.

New Packaging -

Scores of operating men have switched to Kearney Fuse Links — taking advantage of having modern links in modern packages — for practical handling.

Use KEARNE

ROOF of PRO

and Mo

It Pays Long

OUT. Ratings: 5000 to
mp. Note the trip action
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to Insta

KEARNE

FUSE S

YES, more than 99.9% of th
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Another company reports
satisfactory performance of fifte
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into service three years ago.

Other companies have had th
Outs in operation from six
years with fine results.

Actual field performance
such as this, make news that tra
among operating men. It is con
proof that a product has been
designed and well built.

Study some of the features of
Trip Out Switches—point press

JAMES R. KEA

4236 CLAYTON AVE., ST. LOU

FY PRO

For Better Ma

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IEY TRIP OUT
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tacts, "poppet-valve action" of the fuse button head, which instantly relieves gas pressures, toggle action of the positive performing tripping mechanism, balanced design, and other refinements, and you'll realize that these cutouts are built to give long, dependable service.

But let a Kearney Representative show you each feature of this popular switch which now appears on the approved list of so many companies.

Let him demonstrate the advantages of the features pointed out in the large illustration at the left.

Here's a switch which the Kearney Corportation is proud to recommend and to back with a full guarantee for satisfactory results and performance.

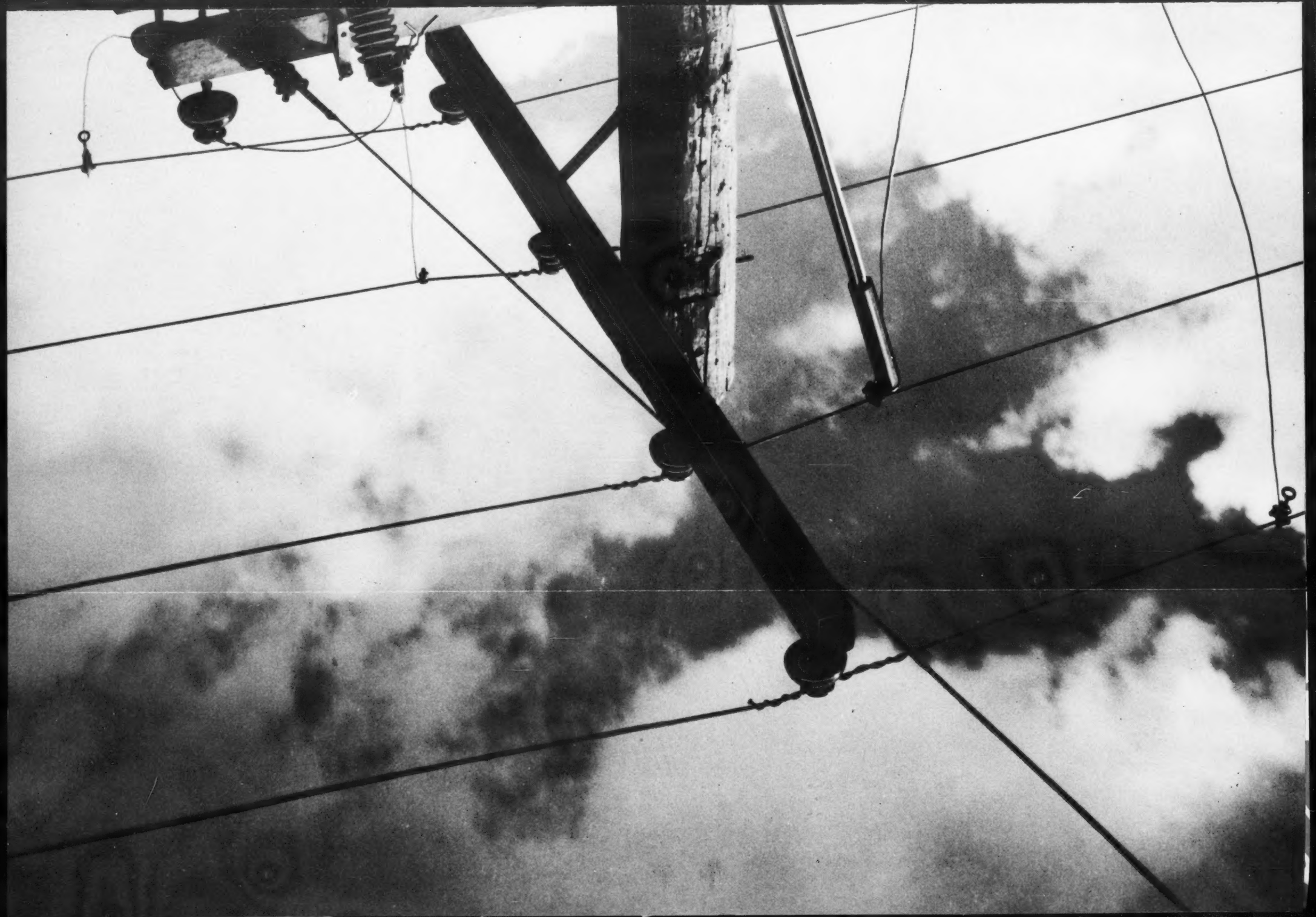
Lastest information and prices on the Kearney line of Trip Out Fuse Switches will be sent on request.

EARNEY CORPORATION

LOUIS, MO. • *Canadian Plant,* TORONTO, CANADA

ODUCTS

Maintenance and Construction—



Protecting a 12.5/7.2 Kv., Main Line From Branch Circuit Faults By Connecting Through KEARNEY TRIP OUT Fuse Switches — Described Within These Pages - - -

Copperweld Dependability FOR ALL THESE

TRANSMISSION LINE COMPONENTS

TRANSMISSION CONDUCTORS
COPPERWELD-COPPER, COPPERWELD, AND COPPER. CONDUCTANCES AND STRENGTHS TO MEET ALL DESIGN REQUIREMENTS.

OVERHEAD GROUND WIRE
NON-RUSTING COPPERWELD (3-WIRE AND 7-WIRE STRANDS) TO MATCH THE LIFE OF THE CONDUCTORS.

GUY STRAND
NON-RUSTING COPPERWELD (3-WIRE OR 7-WIRE STRANDS). PUTS GUY STRAND LIFE ON A COPPER BASIS.

GROUNDING WIRE AND STAPLES
NON-RUSTING. STRONG STEEL CORE REDUCES BREAKAGE, AND DISCOURAGES THEFT AND TAMPERING.

GROUND RODS AND CLAMPS
COPPERWELD GROUND RODS FOR DEPENDABLE GROUNDS. COPPERWELD CLAMPS FOR DEPENDABLE CONNECTIONS.

ALSO COPPERWELD ANCHOR RODS, SPLICING SLEEVES, TIE WIRE, AND NAILS.

COPPERWELD STEEL COMPANY
Glassport, Pa.

TRANSMISSION CONDUCTORS AND ACCESSORIES

Pacific Coast Representative: **C. E. INGALLS**
Rialto Building · San Francisco, California

GENERAL ELECTRIC SUPPLY

SERVES THE WEST!

General Electric Supply Corp. has helped build the West by investing in buildings, warehouses and manpower to serve the needs of the industry. It is an integral part of the industry and its organization has contributed to the expansion and growth of the communities it serves—not alone by contributions to and support of civic development—but by individual work of its employees in community activities of all types.

Offices and Warehouses Where Stocks Are Carried in These Western Cities:

SEATTLE	SACRAMENTO	PHOENIX
SPOKANE	FRESNO	SALT LAKE CITY
PORTLAND	LOS ANGELES	DENVER
SAN FRANCISCO	SAN DIEGO	BUTTE
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Our complete displays of new and improved products are located at all branches. You'll find it easy to make the selection you desire.

Start NOW to profit from General Electric Supply service. Phone or drop in at your nearest branch TODAY.

GENERAL ELECTRIC SUPPLY CORPORATION

EARNEST PROPOSALS are ACCEPTED

Just as earnest marriage proposals made by young men throughout the ages have been accepted by young ladies, so earnest proposals for good wiring made by electrical contractors will be accepted. Today, especially wiring proposals backed up with good designing and materials will be welcomed by customers. Good, dependable wiring is needed in the many buildings about to be erected.

GENERAL ELECTRIC WILL HELP YOU

A G-E handbook on modern industrial wiring practices and another G-E handbook on modern residential wiring practices are available free. One is called "Adequate Wiring for Industry," the other is called "G-E Home Wiring Handbook." These handbooks will help you to plan efficient wiring and to make use of recent developments.

The G-E line of high quality wiring materials is complete, including conduit, wire and cable and wiring devices. These materials give dependable service. They are made to be used together and can be installed quickly. Moreover, G-E Merchandise Distributors are located at all key points in the country. You can obtain G-E wiring materials right in your own territory.

WRITE FOR G-E HANDBOOKS

For further information about G-E wiring materials or for copies of the handbooks see the G-E Merchandise Distributor nearest you or write to Section CDW-196, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

ADEQUATE WIRING SERVES AND SAVES

GENERAL ELECTRIC

Giving the

KIND OF SERVICE UTILITIES WANT

Joslyn

Pole Line Hardware Meets Western Needs For Dependability

● When installing Joslyn pole line hardware, experience tells utility engineers that their lines will last longer. There will be less need of frequent repairing and replacement costs will be lowered. For Joslyn hardware is designed to stand up under long tough usage.

Whether it be transmission, distribution, street lighting equipment or construction materials, Joslyn can give quick, efficient service.

JOSLYN COMPANY

OF CALIFORNIA

Factory
5100 District Blvd.
LOS ANGELES

District Office
180 Potrero Ave.
SAN FRANCISCO

Ground Resistance Meter (618)

A direct reading ground resistance meter with three ranges of 0-20, 0-200 and 0-2000 ohms has been designed by the James R. Kearney Corp. A brief twist of the crank with only one meter reading for each measurement makes this instrument simple to operate. Effects of electrode polarization, galvanic action and stray director or alternating currents are completely eliminated. A long life battery supplies the power and no adjustments are required to compensate for changes in battery voltage or resistances.

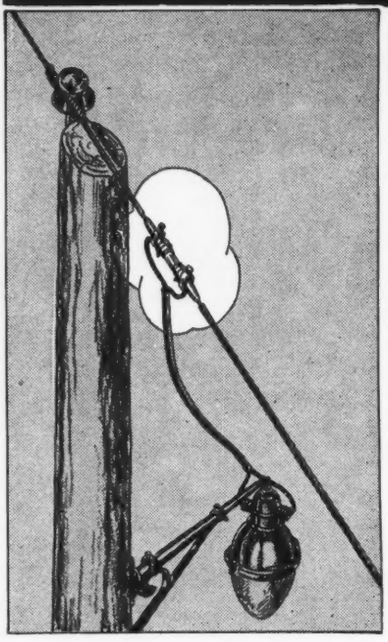
Pole Capacitors (619)

Cornell-Dubilier Electric Corp. presents a new improved group of pole-type capacitors for line power-factor improvement. An exclusive design of internal construction utilizes many small, series-parallel connected sections, each with impressed voltage of less than 600. This construction results in minimum heating, long life, absence of corona and a high factor of safety. Hermetically sealed in arc-welded steel cases and capable of operation outdoors under adverse weather conditions, these new capacitors are designed for standard pole mounting, singly or in multiple units. Available ratings include, 5, 7.5, 10 and 15 kva. for single and 3-phase, 60-cycle lines to 575 volts. For single-phase, 60-cycle lines of from 2,400 to 13,800 volts the 15 kva. units are standard, although 10 kva capacitors can also be supplied for line voltages of 2,400 and 4,160.

Compact Cutouts (620)

Designed for light and medium duty services on distribution lines and substations operating at 2300-13200 volts, Schweitzer & Conrad have added a compact type STD and RTD of cutouts and reclosers. Important is provision for complete, positive separation of the arcing terminals. The flexible cable of the link is pulled straight out of the tube to clear arcs quickly, even in case of low fault currents. A toggle action releases and drops the fuse tube open after the fault is cleared, plainly indicating the blown condition. Reclosers are made up of two or three of the single cutouts with the addition of automatic circuit-reclosing parts and to convert a single cutout into a two-shot or three-shot recloser. All parts are finished, drilled, tapped to make these conversions and assemblies possible in the field. All types are furnished for three voltages: 5000, 7500/12,500, and 15,000. Fuse tubes are rated at 100 amp.

modernize YOUR DISTRIBUTION PRACTICE—



RELIABLE INSULATED STRAIGHTLINE SPLICE

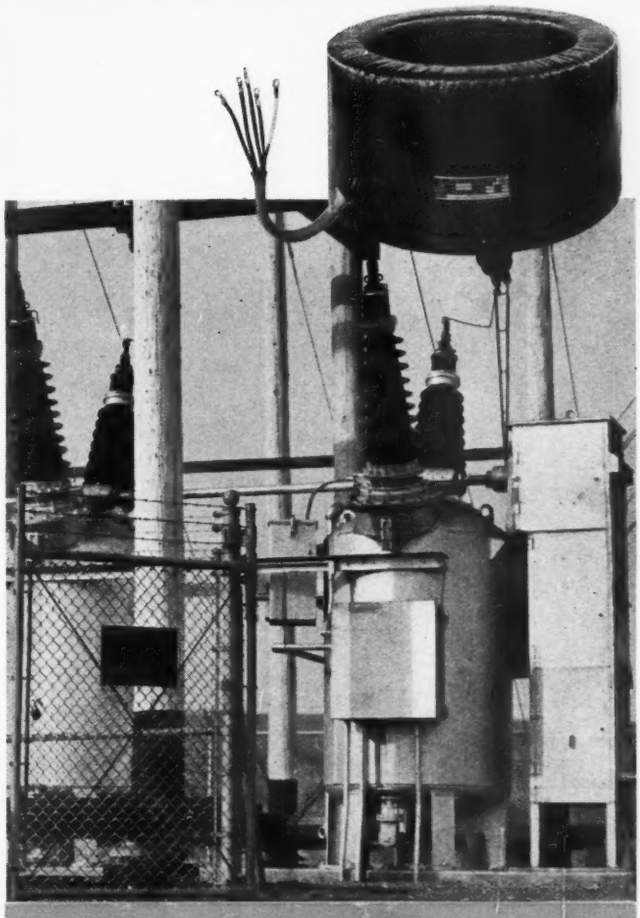
A neat and convenient means of breaking the line for series street lighting, for secondary banking, for sectionalizing. Will develop full line wire strength and may be installed on existing construction without splicing in an extra length of wire.

Insulating section is a tough and strong plastic with high dielectric strength which will not carbonize nor absorb moisture.

Reliable ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE • CHICAGO ILLINOIS

Exclusive PACIFIC ELECTRIC *BUSHING-TYPE CURRENT TRANSFORMERS are* HIGHLY ACCURATE

For METERING SERVICE Type CP Transformers May Be Installed in Pacific Electric Breakers to SAVE MONEY!



You have high accuracy in metering with our Type CP Bushing-Type Current Transformers.

You save money as separate tank, oil and bushings are not needed. They are safer, require less space and save hazard.

This equipment, factory installed on Pacific Electric Oil Circuit Breakers, is another advantage for you when you specify the reliable Pacific Electric Breakers and CP Transformers.

WIN HIGH PRAISE

Bushing-Type-CP Current Transformers, perfected and sold for years by Pacific Electric Mfg. Corp., are praised by utilities wherever high-accuracy metering is demanded. With more and more interconnection of systems and metering at high voltages, it will pay you well to look into this exclusive highly-accurate, money-saving Pacific Electric equipment. Write now.

YOURS WITH PACIFIC ELECTRIC BREAKERS!

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1006 Securities Bldg.
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U. N. Halliday
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Northwest Supply Co.,
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Phoenix, Ariz.

Electric Steel Foundry Co.
P. O. Box 2696
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Other Representatives in Principal Cities

Yes, Pacific Electric Oil Circuit Breakers can be equipped with the PATENTED Bushing-Type-CP Current Transformers, pioneered and perfected by Pacific Electric Mfg. Corporation, specialists in high-voltage switching equipment.

Pacific Electric Mfg. Corporation

5815 THIRD ST., SAN FRANCISCO, CALIF. DUNES HIGHWAY, GARY, INDIANA

Long Term INSURANCE

against production bottlenecks . . . high maintenance!

Here are three WESTON Instruments that provide the dependability, the broad utility and the time-saving facility *essential* for successfully battling today's production bottlenecks . . . keeping crowded production lines rolling smoothly and efficiently. But like all WESTON Instruments they are designed and built with an eye on *your* future . . . built to give the "long-term" dependability which stems from WESTON design and manufacture. Thus they will *protect* you during this active defense period . . . and their protection against inefficient operations and high costs will remain in "full force" long after the defense period has passed. Literature gladly sent on request. Weston Electrical Instrument Corporation, 577 Frelinghuysen Avenue, Newark, New Jersey.

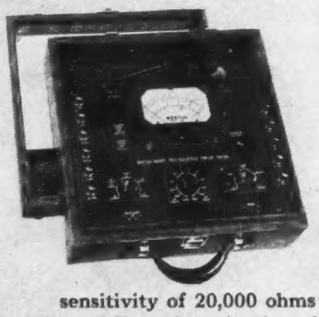
WESTON *Instruments*

The WESTON (Model 633)
AC Clamp-Ammeter

Provides the *quickest, simplest* means for testing electrified equipment *regularly* . . . thus insuring efficient, uninterrupted operations . . . forestalling costly power leaks, or breakdowns. The clamping jaws are simply closed over the conductor or bus-bar, and current reading taken. Circuits are never disturbed . . . work never interrupted. A big time and money-saver in any shop. Has 6 current ranges for maintenace needs.

The WESTON (Model 703)
Foot-Candle Meter

Measures fluorescent, mercury-vapor, incandescent and all other types of lighting *direct* . . . without correction factors. Equipped with the WESTON VISCOR filter . . . a stable, all-glass filter which corrects for all types of lighting regardless of color composition. Saves time, eliminates errors in testing. Available in models for shop and laboratory requirements.



The WESTON (Model 785)
Industrial Circuit Tester

With 27 carefully selected voltage, current and resistance ranges, Model 785 handles "trouble" in the most efficient, practical manner. With DC voltage sensitivity of 20,000 ohms per volt, it is ideal for testing sensitive relay circuits, signal and telegraphic systems, photocell circuits, alarm systems, etc., etc. . . . also for testing small motors and controls, lighting circuits, etc., etc. Can also be used with current transformers and voltage multipliers.

WESTERN REPRESENTATIVES

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263 Colman Bldg.

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Herman E. Held,
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A. A. Barbera,
Subway Terminal Bldg.

Denver, Colo.
Howard Peterson
1921 Blake St.

Phoenix, Ariz.
J. E. Redmond Co.,
448 W. Madison St.

Aerial Cables (621)

Two new types of self-supporting aerial cables for use on urban, suburban, and rural power circuits in place of bare weatherproof, tree wire, or cable on messengers, have been added to the General Electric line. The new cables, designated "SS" are of the 4- and multiple-conductor type, supplementing the 2-conductor type recently introduced. Characteristic and distinctive feature of the "SS" line is its outer covering, consisting of galvanized steel wires for mechanical strength, interwound with electric conducting wires of copper. The 2-conductor type is for single-phase circuits with one side grounded from 4000 up to 15,000 volts. The four-conductor type is for 3-phase, 4-wire circuits with grounded neutral, up to 5000 volts. The multiple-conductor type is used for telephone, supervisory and other control circuits.

Demand Meter (622)

A new demand meter featuring a built-in time-interval mechanism is announced by the Meter Division of General Electric Co. Designated PD-7, the new meter supplements the PD-5, which employs a separately installed contact-making clock for control of its timing and recording mechanism. According to the company, besides requiring less space for installation the PD-7 demand meter permits savings in installation and wiring cost. The interval timing mechanism in the PD-7 is of the Telechron synchronous motor type. It is located for convenience on the back of the meter, and may be inspected by swinging the hinged grid of the meter forward. The PD-7 is provided with five terminals so that it can be used in combination with the PD-5 where two synchronous records are required, as for "in" and "out" demands of a single installation, or kw and rkva demands. In such applications the timing mechanism of the PD-7 meter controls the printing and reset of the PD-5.

Circuit Breaker (623)

Line Material Co. has developed a low-priced L-M circuit breaker for single-phase operation built for use on rural lines and heavy lightning areas and in locations that are sometimes inaccessible. Fully automatic in operation, the breaker opens the circuit instantly when a fault occurs. It automatically recloses after a 3-second interval and must repeat the opening and reclosing operation three times in rapid succession before permanently locking out the line. Special safety devices prevent it from reclosing a circuit accidentally. No exposed parts are energized at any time.

Protective Search light (624)

A new low-cost, 18-in. 1000/5000-watt incandescent searchlight has been announced by General Electric. It is adapted for use in protective lighting systems. The new searchlight is equipped for pilot-house or hand control, with high or low pedestal. A highly efficient silvered glass parabolic reflector provides accurate control of the light beam. A spherical auxiliary reflector in the front of the lamp eliminates stray light and builds up beam intensity.

Hanger Fitting (625)

A new adjustable ratchet hanger fitting designed to attach to No. 3000 Wiremold fluorescent lighting channel, permits adjustment of fluorescent lighting fixture to desired angle.

RUBBER COVERED POWER CABLES • BUILDING WIRE

FIVE REASONS WHY YOU SHOULD BUY CRESCENT

GENUINE A.B.C. Armored Bushed Cable

1 CONDUCTORS — Clean stripping insulation and flame retarding covering, printed as shown.

2 BUSHING—easy to insert as paper unwraps from *under both ends* of armor to make room for the bushing.

3 STEEL ARMOR—low resistance, electro-galvanized for maximum uniformity and longest life.

4 TESTED—Thoroughly tested at several points during manufacture and receiving a final test of 2000 volts between conductors and armor.

5 *CRESCENT has unexcelled facilities for the complete manufacture of Armored Bushed Cable in all its steps. When you buy CRESCENT A.B.C. ARMORED BUSHED CABLE you buy the best. Do not be satisfied with any substitute.*

CRESCENT INSULATED WIRE & CABLE CO.

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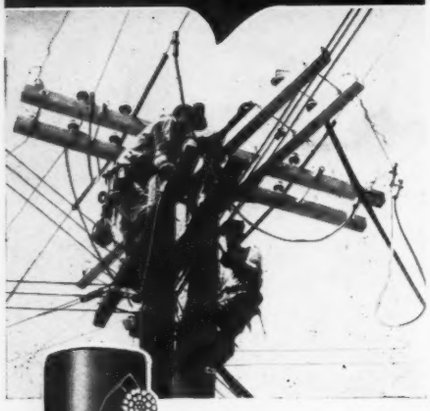
CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

ARMORED CABLE • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • VARNISHED CAMBRIC

CRESCENT ENDURITE SUPER - AGING INSULATION

"They're the safest, most practical clamps we've used"



Ask the men who use them, about TIPS JUMPER CLAMPS

They'll say they like the corrugated rubber handle because it provides an extra firm grip for easy control and tight contacts. They like the simple easy method of attaching cable. They appreciate the fact that all metal parts except the open jaws are covered with insulation and that the hand guard not only prevents them from getting too close but also reduces surface creepage. They can be assured that Tips jumper clamps are safe. The tough rubber or fiber insulation has a breakdown point in excess of 6,000 volts.

The photograph above shows the rubber insulated clamp with corrugated handle—overall length 9". At right is the same head with special hand guard and long fiber handle—overall length 16".

For more complete information, consult your Tips Tool Catalog No. 8 or ask your jobber.

A·B·CHANCE CO. CENTRALIA MISSOURI

Bus Support Clamp (626)

To simplify the installation of flat bar bus structures, Burndy Engineering Co. offers its type HHV bus support clamp. This clamp supports the flat bar vertically. The same clamp may be used to hold one or more flat bars. If the supporting insulator is slightly out of line with other insulators, a "slide track" in the clamp permits compensation so that the flat bar itself remains straight and true. This unit is made of high strength aluminum bronze, and is available for any number of bars of 1½-in. to 12-in. widths.

Nesco Chef (627)

National Enameling & Stamping Co. has developed a low-cost, complete cooking appliance known as the Nesco Chef which combines features of an electric roaster, broiler, broiler and surface unit. Nesco Chef operates on 110-115 volts and is designed to sell for less than $65. There is a large 18-qt. roaster oven with porcelain enamel wells and 3 insert pans. The glass wool insulated roaster oven is regulated by an accurate thermostat with signal light control and may be turned on and off automatically by a time clock available as accessory equipment. Surface and broiler units with 600-watt, 1200-watt and 1600-watt combinations, fill the need for quick surface cooking and broiling.

Ventilating, Exhaust Fans (628)

Emerson Electric Mfg. Co. has published a new catalog "Emerson-Electric Ventilating & Exhaust Fans." This 16-page catalog describes Emerson Electric exhaust fans, shutters and protective mesh guards, kitchen ventilating equipment including the new line of Emerson-Junior kitchen ventilators. Information contained includes discussions of ventilation—where and how to install exhaust and ventilating fans for maximum benefits, how to determine the most effective size of fans to use, and dimensions, performance and prices of all Emerson fans.

Explosion-proof Breaker (629)

Meeting the demand for an air circuit breaker for use in hazardous locations, General Electric has available type AE-1B breakers in explosion-proof boxes for applications in all groups of Class I locations as defined in the National Electrical Code. This development supplements the AE-1B line which includes units for mounting in individual metal enclosures or on switchboards in central station, industrial, and building equipment service. The breaker is rated 25,000-amp. interrupting capacity, 600 volts a.c., 250 volts d.c., for continuous currents up to 600 amp.

Sun-Switch (630)

United Cinephone Corp. has developed the Sun-Switch, a new photo-electric relay for lighting and power. Sun-Switch is used to control electrical circuits in accordance with the rise and fall of natural illumination. The user chooses the two lighting levels at which he wishes the load switched on and off, and adjusts the calibrated dials to the corresponding foot-candle readings. Operation is entirely automatic, no resetting being necessary. Specifications of the unit are: Housing of weather-proofed drawn metal, dimensions 10¾x5⅜x3½ in. Control circuit uses a type 921 photo-tube, of 20,000-hr. life expectancy, and two type 6J5 tubes of 5,000-hr. life expectancy. Operation is from 110 volts, 50 or 60 cycles, a.c.

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Our Bank-by-Mail Service is a big convenience to salesmen, office workers, travelers ...all who can't go to the bank whenever they wish. Let us send you the simple instructions for doing your banking safely and efficiently in your spare time, wherever you may be. Overnight service to most places in California.

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ALL KINDS
of SMALL
TRANSFORMERS

—in the JEFFRIES line

Practically all your small transformer needs are supplied by the Complete Jeffries line. We have specialized for years in providing transformers to exactly match your requirements. If not in our regular line, we build to meet your specifications—in a hurry!!

Minimize your voltage losses. Specify scattered transformers to eliminate duplicate conduit runs, and save on power costs.

JEFFRIES TRANSFORMER COMPANY
1710 E. 57th St. Los Angeles, Calif.

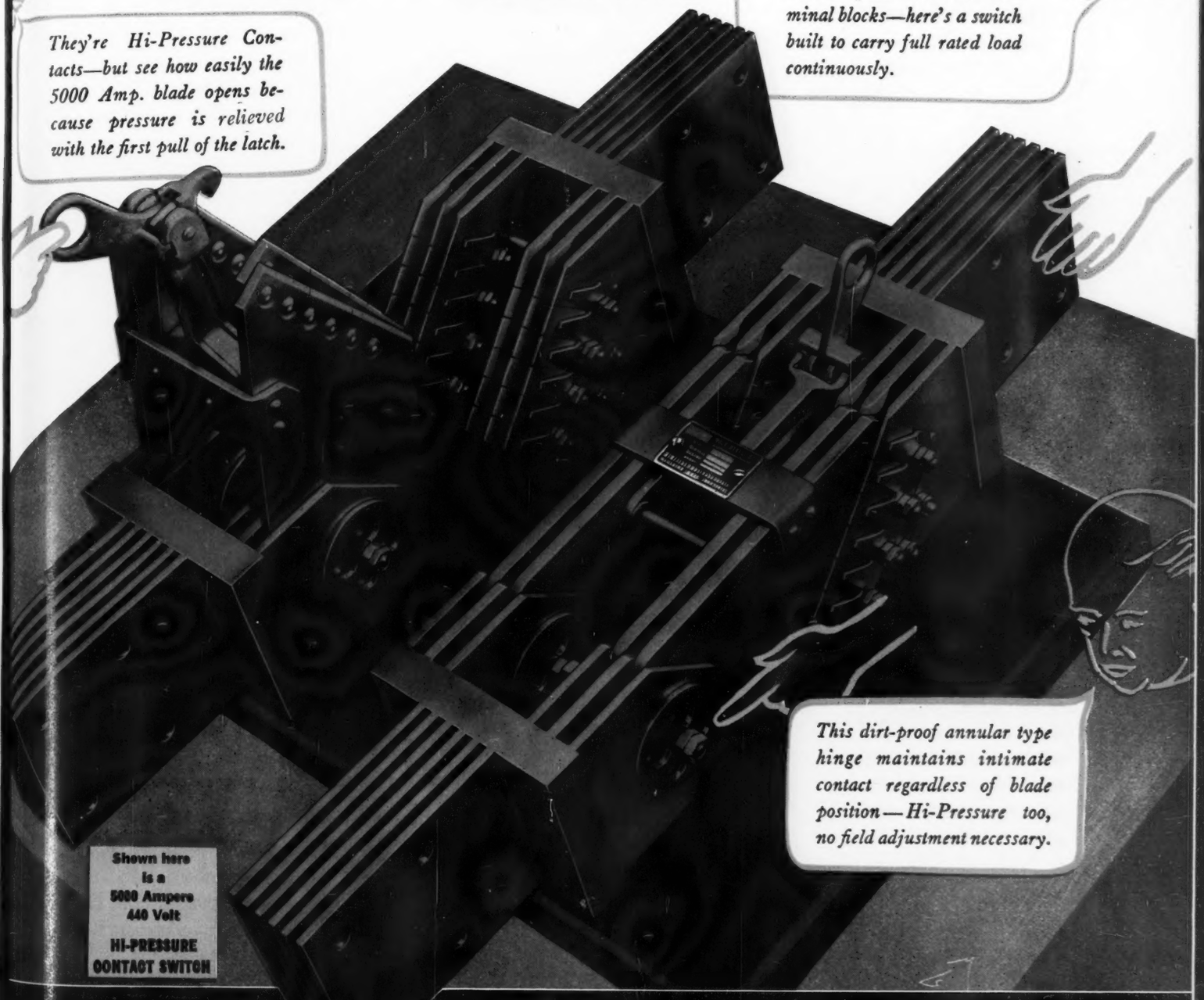
R&IE *Craftsmanship*

Craftsmanship, **in the individual creation of things throughout the centuries, reflected diligence, genius and love of doing things well. The workman's each and every production became a portion of his very life and soul . . . . .**

Craftsmanship, **in mass production as shown in R. & I. E. switching equipment today, reflects the same diligence, genius and love of doing things well. One or one-hundred R. & I. E. switches are equally superior in design, workmanship and long day-in and day-out service.**

They're Hi-Pressure Contacts—but see how easily the 5000 Amp. blade opens because pressure is relieved with the first pull of the latch.

And note the straight-line current path and solid terminal blocks—here's a switch built to carry full rated load continuously.



This dirt-proof annular type hinge maintains intimate contact regardless of blade position—Hi-Pressure too, no field adjustment necessary.

Shown here is a 5000 Ampere 440 Volt HI-PRESSURE CONTACT SWITCH

HI-PRESSURE CONTACT *INDOOR* SWITCHES

RAILWAY & INDUSTRIAL ENGINEERING CO., Greensburg, Pa. IN CANADA — EASTERN POWER DEVICES, LTD., TORONTO

NEW! 2100 LINE

COMBINATION METER and CURRENT TRANSFORMER CABINETS

IDEAL FOR OUTDOOR OR INDOOR USE

30" HIGH
18" WIDE
8½" DEEP

- Meter panel with Test Block bridge removable as a unit. Affords maximum working space when installing transformers and wiring in cabinets. Allows meter and test switch to be wired in laboratory.
- Designed for use with low voltage current transformers, accommodates three. Economical, it provides a universal low cost cabinet for the modern meter department.
- Descriptive catalog sheets are sent to our mailing list. For further information please write

METER DEVICES COMPANY - CANTON OHIO

Vacuum Offers (631)

Westinghouse is making two special vacuum cleaner sales offers for spring and summer activities. One is a new cylinder-type cleaner and the other is on the Westinghouse line-leader—the Captain, a motor-driven brush type cleaner with self-adjusting nozzle. Introductory offer on the cylinder cleaner, which normally will retail for $49.95, is a $10 trade-in allowance, dealers getting full disocunt on the $39.95. The Captain sales combination is a three-in-one offer, valued at $58.90. It includes the Captain, regularly sold for $39.95, and the Floor-Cruiser, the exclusive Westinghouse two-in-one cleaner, regularly priced at $18.95. The cleaner can be lifted from its frame and used as a hand vac.

Apex 128 (632)

Apex-Rotorex Corp. has in its 1941 line the model 128 Apex Cleaner in 2-tone finish, with chassis in blue and white webite enamel and floorlight hood in polished chrome plate. The motor is of the horizontal type, operating on either a.c. or d.c. current. Brush is adjustable for wear. Wheel design and cleaner balance provide automatic self-adjustability of the nozzle. Shaddo-Lite turns on as cleaner operates, lighting up dark corners. Two sets of attachments are available.

Universal Vacuum (633)

Universal's line of new vacuum cleaners includes 4 conventional type floor models, three hand vacuum cleaners, and 2 clean-air tank type cleaners. The selling features of the floor models are: motor-driven oilless bearing brush, ball-bearing motor, chrome handle and hardware, rubber handle grip, single nozzle adjustment, tilting device on side of handle bail, double rear swivel wheels, new headlight and motor housing. Model E440 is super-powered with a 2-speed, air-cooled motor and has a pedalock tilting device, a pedalever 5-position nozzle adjustment and a Hi-Lo Toe-operated motor speed regulator.

Time Controller (634)

A time controller for automatically controlling the operating period of attic fans, store lighting, refrigeration systems has been made available by Minneapolis Honeywell Regulator Co. This simple timing mechanism may be set to close a circuit for any period of time from ½ to 11 hr. by dial. When time period has elapsed, switch will automatically open and break the circuit through the electrical load. To open circuit at any time, if this should become necessary, it is only necessary to turn the nob in the opposite direction back to zero. It is equipped with a snap-action single pole double-throw switch so that it may also be used to interrupt an electrical circuit and then after a definite period of time reclose the circuit.

Electric Furnace Switch (635)

Delta-Star Electric Co., to meet the demand for an electric furnace switch has an unique double throw 48,000-amp. switch. The series-parallel interconnections are factory assembled to permit direct connection to the 8-coil transformer terminals. Contacts are protected against heating due to oxidation and supporting frame is non-magnetic to minimize inductive heating. Mechanism is interlocked to prevent opening under load.

Hesse's Utility PORTABLE ELECTROPLATER

"Brings the plater to the work"

ELIMINATES CONSTANT MAINTENANCE — REDUCES OVERLOAD TEMPERATURE

Here is a safe, easy, economical way to Silver Plate Disconnect, Circuit Breaker and other Switch Contacts, Bus Bars, etc., without removal. No plating tanks are necessary. Used by Utilities, Manufacturers and U. S. Government in Power Plants, Shop and Field Work. Hesse Electroplater also made for other metals such as copper, nickel and cadmium, etc.

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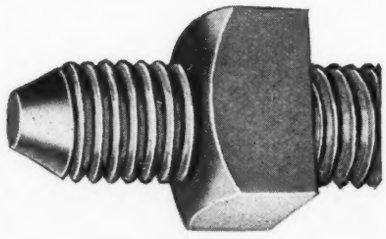
Protects driving head
Protects first threads
Nut starts easier



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DON'T PAY
FOR CURRENT LOST IN TRANSIT!

"LO-X" BUStribution DUCT increases current carrying ability — minimizes losses from heating and voltage drop.

"LO-X," the latest addition to Bull Dog's Flexible Electrical Distribution Systems, assures industrial users of electrical power of ample voltage at the point of application — motor, welder, *inductive load—wherever and whenever needed.*

"LO-X" is designed especially for the most efficient distribution of current in the conductors, and for the most effective heat dissipation characteristics. The result is greater current carrying ability, lower temperature rise and less voltage drop due to reactance.

"LO-X" may be used alone, or it may be used as a Feeder with Bull Dog's "Plug-in" type BUStribution DUCT and associated fittings. Whatever the installation, "LO-X" affords a high load capacity, better voltage regulation, greatly reduced line drop—and consequently more efficient and uniform operation.

"LO-X" BUStribution DUCT is available in from 500 amp. to 4,000 amp. capacity, 600 volts or less, single phase, three phase, and three phase 4 wire. Write for complete information, or ask to have a Bull Dog sales engineer call on you.

For welder installations such as the one shown here, and for similar inductive loads, especially at low power factors, "LO-X" BUStribution DUCT affords a high load capacity, better voltage regulation, and consequently more efficient and uniform operation.

PACIFIC COAST REPRESENTATIVES

For prompt action, address your inquiries to these Pacific Coast assembler representatives, who can give you immediate information and service on the complete Bull Dog line of Standard and Engineering Products.

COAST ELECTRIC & MANUFACTURING CO.
1720 N. E. Sixth Ave. • Portland

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ELECTRIC PRODUCTS CO.

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Bull Dog Electric Products of Canada, Ltd., Toronto, Ontario

MANUFACTURERS OF Vacu-Break Safety Switches, Circuit Master and SafToFuse Panelboards, Switchboards, Duct Systems—FOR LIGHT AND POWER

WHEN A RESISTOR
SWEATS

Moisture, visible or invisible, will cause trouble if it can penetrate the protective surface of a resistor. A microscopic examination of the surface of a Ward Leonard Vitreous Enamelled Resistor will show why this Resistor is able to give satisfactory service under all climatic conditions. Its freedom from even minute enamel crazes or cracks is unique. With such complete protection of the wire, moisture is effectively excluded. The Vitreous Enamel of Ward Leonard Resistors is processed at a temperature above 1400° F. Thus all elements of the enamel are perfectly fused and envelop the wire in a sealed, protective, glass-like enclosure.

RESISTOR BULLETINS

Bulletin 11 tells about Vitrohm Enamel Wire Wound Resistors, gives sizes and watt ratings.

Bulletin 19 describes Ward Leonard Ribflex Resistors for unusually heavy duty.

Bulletin 22 is on the subject of Non-Inductive and Non-Capacitive Resistors.

Bulletin 25 is a treatise of standard and special Resistor Mountings and Enclosures.

Send for bulletins of interest to you.

WESTERN REPRESENTATIVES

Raymond Ackerman, 318 Dooly Block, Salt Lake City, Utah
Northwestern Agencies, 2411 First Avenue, Seattle, Wash.
A. R. Slimmon, 445 East 3rd Street, Los Angeles, Calif.
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WARD LEONARD

Electric Control Devices Since 1892

Ward Leonard Electric Company, 48 South Street, Mount Vernon, N. Y.

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MAGAZINES
in quick review

Electric Rangs

An interesting article on the use of electric ranges appears in the June *McCall's*, which shows pictures of electric timing devices and several good pictures of an electric range. General readers of the magazine will undoubtedly pause at this story because several recipes are included, utilizing the timer mechanism. In the same issue a story on a typical American family includes reference to the electric facilities in their home.

Dental Lighting

"An Engineering Analysis of Dental Lighting" in the April *Illuminating Engineering* is the report of the Southern California Section, I.E.S., which made a special study of this problem. The issue also contains a number of useful monograms for routine illumination computations by William M. Armstrong, formerly of San Francisco, now with Von Hamm-Young Co., Honolulu.

Interfim Revision

Qualified Contractor for May contains the complete National Electrical Contractors Assn. request for interim revision of the Code to simplify wire types and wiring tables, by George Andrae.

The same issue contains a comparison of costs of various types of wire made by Ray Ashley, research engineer, Electrical Contractor's Assn. of Chicago.

Insulation Resistance

"How Insulation Resistance Varies" by Graham Lee Moses of Westinghouse in the May *Electrical Contracting*, p. 24, is a valuable article for the motor house and industrial contractor, and for maintenance electricians.

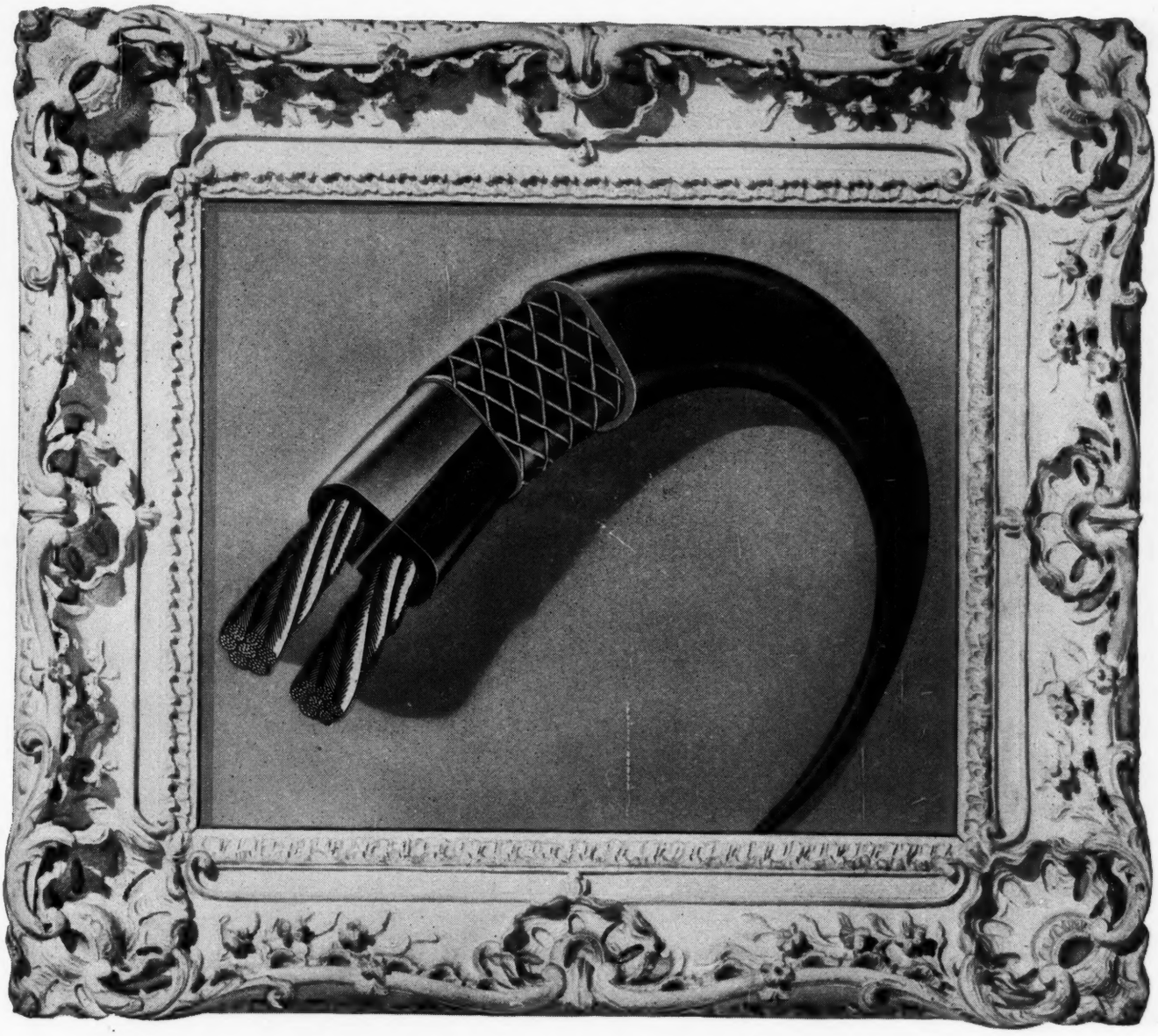
BOOKS
you may want

Wiring anual

"Practical Electrical Wiring" by H. P. Richter, 2nd edition, McGraw-Hill Book Company, Inc., $3.50. Revised to conform to the 1940 National Electrical Code, this practical treatment of residential, farm and industrial wiring, thoroughly illustrated, covers the various wiring methods applicable to residential, farm and industrial installations.

Housewares Directory

The 1941 National Housewares Directory has distributed 4,000 copies of the new issue, which the publishers announce as the largest number yet produced. The directory runs 330 pages in length and copies have been addressed to every major housewares buyer, to every Pot and Kettle member and to advertisers and agencies who handle copy. Included in the book are brands and trade names, a special service section, (hotels, warehouses, etc.) Pot and Kettle Clubs directory, manufacturers, sales representatives, classified products.



Portrait of a Heliophile*

Ten thousand feet high in the Chilean Andes, you can get an awful sunburn . . . and so can cables. The actinic rays of the sun that high, raise "hob" with cable coverings.

Awhile back, Chile Exploration Company decided they were sick of the hob and gave our research engineers the job of making a cable that could lie in the broiling sun day after day without cracking and failing. So, we made Sunex Securityflex†, a cable that defies the sun ten thousand feet high in the mountains and with equal defiance faces the rough and tumble conditions of mining 3,000 feet below the surface of the earth.

It is an example of the resourcefulness of Anaconda research. It is the same kind of research that produced a great basic advance in paper cable manufacture . . . Type CB† construction that outlasts the standard type by an easily recognizable margin.

The advantages of this research go into every product made by this company... and that includes a wire and cable for every electrical requirement. Put them to work for you. There is no premium.

Anaconda Wire and Cable Company
General Offices, 25 Broadway, New York City; Chicago Office: 20 No. Wacker Drive. Subsidiary of Anaconda Copper Mining Company. Sales Offices in Principal Cities.
†Reg. U. S. Pat. Off. 41385

ANACONDA
from mine to consumer

This familiar trademark identifies Anaconda products. It symbolizes the best efforts of man and science.

*Borrowed from the Greeks: *helios* (sun) and *philos* (love of)

USE MODERN IMPROVED

ANACONDA WIRE AND CABLE

THOMAS "QUIET-TYPE" INSULATORS

UTILITY EXECUTIVES — alert to the public demand for noise-free radio reception, are instructing their Engineers to install noise-free insulators on all new construction.

UTILITY ENGINEERS — after careful consideration of all methods of combating radio interference, are choosing Thomas "Quiet-Types" for permanent elimination of insulator radio-noise.

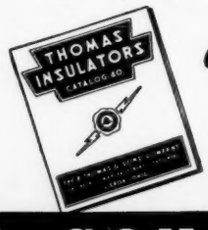
. . And here are the REASONS WHY!

● All Thomas "Quiet-Types"—Switch or Bus, Suspension-Strain, and Pin Types are guaranteed noise-free and each incorporates the Thomas patented "Under-Glaze Process."

● Combined with our under-glaze, noise-eliminating process, which is a definite plus value, the user of Thomas "Quiet-Types" gets an insulator of time-tested design whose performance is unexcelled for reliability.

● Noise-free characteristics of Thomas designs were so carefully developed they do not impair the insulator's desirable features as an insulator; and the Thomas "Under-Glaze Process" does not in any way harm the porcelain structure but maintains electrical, thermal, and mechanical characteristics at the highest degree of perfection.

● The slight additional cost over conventional type insulators is relatively speaking your best investment when customer goodwill is maintained by the quiet operation of your lines. Thomas "Quiet-Types" cost you no more than similar insulators—install them today for better service. They're backed by 68 years of manufacturing experience.



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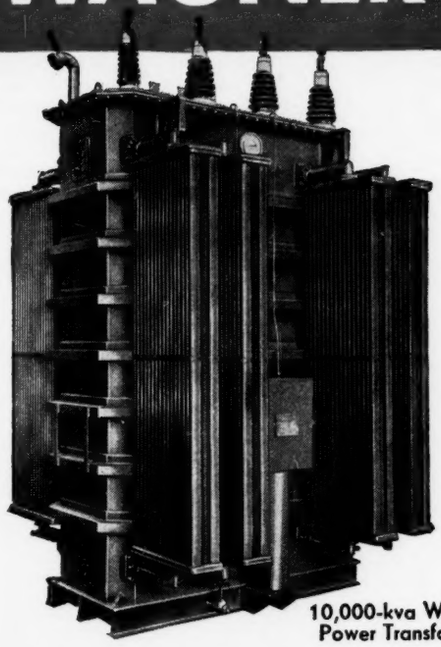
No 'BLACKOUTS' when WAGNER TRANSFORMERS are on the job —

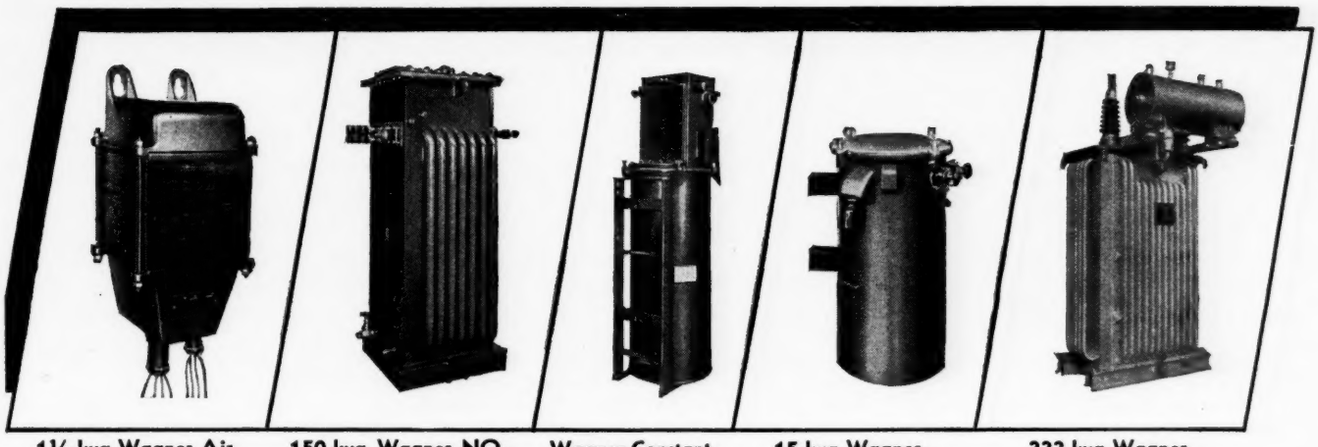


10,000-kva Wagner Power Transformer

The vital link in any power distribution system is the transformer. Electric power companies know that successful operation depends directly upon the quality of their power equipment.

Actual performance records of installations in all parts of the country show conclusively that Wagner transformers do give many years of continuous, trouble-free service. Records like these do not happen by chance. The reason for these superior records is that every transformer manufactured by the Wagner Electric Corporation has the benefit of 50 years of transformer engineering and manufacturing experience behind it.

All types and sizes of transformers are built by Wagner and the same high quality of material and workmanship goes into the construction of each one. You can effect considerable savings in operating and maintenance costs by specifying Wagner on your next request for quotations.



1½-kva Wagner Air Cooled Transformer | 150-kva Wagner NO-FLAMOL Transformer | Wagner Constant Current Regulator | 15-kva Wagner HEX Transformer | 333-kva Wagner Power Transformer

The defense program is making and will continue to make heavy demands upon power companies for an ever increasing output. The degree to which your company is able to meet those demands depends, of course, upon several factors, not the least of which is the type of equipment used. Wagner transformers have definitely proved their efficiency and dependability through 50 years of faithful service to the power industry. Put Wagner transformers on the job in your plant as a safeguard against "BLACKOUTS" due to transformer failure.

It is to your advantage to have complete information on all types of Wagner transformers. Send for Bulletins TU-180 and TU-181.

T41-8

Wagner Electric Corporation

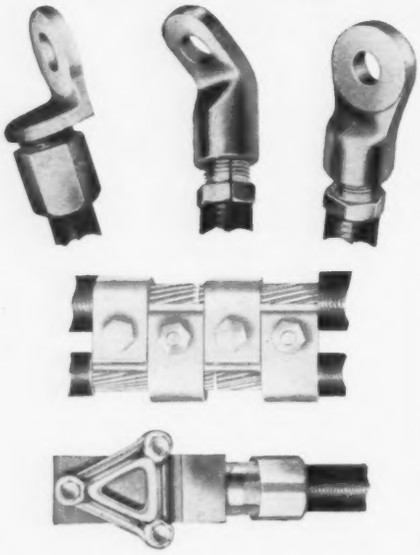
6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

TRANSFORMERS · MOTORS · FANS · BRAKES

Here's why

GORILLA GRIPS

are better



Permanent Grip—In every Gorilla Grip Contactor the principles of nut and wedge are used for a maximum compression, dependable locking action in every conductor.

Perfect Contact—Pressure is uniformly distributed over full contact area of the conductor.

Wire Application—There is a Gorilla Grip for every conductor, no matter where it taps or terminates.

Salvage—Can be used over and over again.

Easy Installation—Requires no special tools.

Gorilla Grip Stock Sets.
Assembled to meet your needs.
Write for descriptive book.

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BULLETINS

data books, etc.

Keep Posted for 1c

Your being right up-to-the-minute may have an important bearing on your success. New developments are appearing daily in your field—tools to help you do a better job. Are you abreast of them? You fall back a step when the other fellow is well informed about a subject of which you are ignorant. Manufacturers' publications are a quick, efficient way for you to keep posted on current events in your field.

Isn't it a bargain to invest 1c (the cost of a postcard) to help earning power to which you look forward? American industry is offering a remarkable service—free. ELECTRICAL WEST makes it easy for you to enjoy this service for your own. Check and mail the coupon below. That's all you have to do to help yourself toward better performance and greater rewards.

Ammeters and Voltmeters (635)

Improved a.c. and d.c. ammeters and voltmeters for general use are described in a new 12-page bulletin published by Westinghouse. The ammeters are available in ranges from 5 to 125 amp., and the voltmeters are made in ranges from 90-140 to 450-700 volts. Switchboard, portable, wall, and socket types are described, special attention being given to application. List prices are quoted for all meter ratings and styles.

* * *

"Quick Selector" (636)

A 64-page 1941 revision of the "Quick Selector" catalog is announced by Westinghouse. According to the company, this catalog has found wide use because it simplifies the selection of electrical equipment for any motor, lighting or feeder circuit. Subjects covered include safety switches, nofuze breakers, multibreakers, panel boards, motor controls and motors. Revisions include equipment additions, price changes, and up-to-date application data.

* * *

Arc Welders (637)

Emerson Electric Mfg. Co. offers a new consumer folder telling of Emerson-Electric a.c. arc welders. Four models with maximum capacities of 75, 150, 200 and 300 amp. are illustrated and described. Practical suggestions for obtaining maximum results and usage are put forth by company engineers.

* * *

Fan Design (638)

Emerson Electric Mfg. Co. has produced a pocket-size 24-page catalog describing for 1941 new fans with improved performance and design. Listed are nearly 100 models including desk and stand fans, air circulators, ceiling fans, exhaust and ventilating fans.

Tips by Trico (639)

Trico Fuse Mfg. Co. has published a new catalog on how to secure maximum fuse protection, remove and replace fuses safely, eliminate poor contact between fuses and clips, and lubricate all types of bearing surfaces with modern, visible automatic oiling devices.

* * *

Circuit Breaker Data (640)

Data on power circuit breakers for use on lines between 750 and 230,000 volts are tabulated in a new booklet announced by Westinghouse. Information in the booklet is designed to assist in the proper selection and application of breakers with respect to maximum operating voltage, maximum continuous current, interrupting ratings, and time delay from energizing trip coil. Data are listed for the following breakers: indoor power air circuit breaker, small oil circuit breaker, indoor and outdoor oil circuit breakers. Continuous, short time, and interrupting current and voltage ratings are given for each breaker type.

* * *

Air Circulators (641)

An 8-page air circulator catalog has been published by Emerson Mfg. Co. describing their line of air circulators. Along with the description, the catalog includes performance information and detailed specifications. Pictured are uses of air circulators extending from the small business to the proper ventilation of large industrial buildings.

* * *

Protective Lighting (642)

Line Material Co. has published a colorful bulletin describing the protective lighting equipment now being made available by the company for the protection of manufacturing plants, power plants, railroad yards and other industrial properties. The bulletin illustrates various units with diagrammatic cross sections for complete operation explanation.

* * *

Portable Tester (643)

A 12-page catalog issued by Leeds & Northrup Co. describes a new portable equipment for measuring, at a normal test voltage of 10,000 volts, the power factor and capacitance of installed bushings, insulators and other high-voltage dielectrics. Because this equipment is immune to electromagnetic and electrostatic stray-fields, because it reads directly in terms of capacitance and power factor, and because it is unnecessary to apply correction factors at the normal test voltage of 10,000 volts, operation is rapid and convenient. Safety guards protect the operator from high voltage.

* * *

Wirewa (644)

National Electric Products Corp. have produced a colorful booklet on their 4x4 Wirewa units. The booklet is illustrated with actual installations, diagrams and pictures of the items, with specifications. According to the manufacturers, any combination of wiring is possible with 4x4 Wirewa, with room for splicing or tapping, within the limits of the NEC.

* * *

Voltage Regulators (645)

A 15-page booklet describing type BJ voltage regulators for generators with indirect acting exciters is announced by Westinghouse. Application to medium and large size a.c. generators as well as synchronous motors and condensers is discussed. Operating details are pro-

Better appearance

THAT LASTS LONGER

A completely welded enclosure being lifted out of the last of five tanks of the Bonderizing process. This enclosure will not be touched again until after it has received its primer coat of paint.

Man, standing at the far end of this photograph, gives an idea of the size of these five tanks, each of which is large enough to take any standard unit now manufactured. Enclosures are cleaned, rinsed, processed, rinsed and hardened in succession. They come in from the welding assembly floor; they leave with the primer coat of paint already on—without having been touched by hand.

WESTINGHOUSE METAL SWITCHGEAR ENCLOSURES ARE BONDERIZED AS *COMPLETE UNITS*

New Bonderizing equipment now enables Westinghouse to offer, at no extra cost to you, a finer, longer lasting switchgear finish which will endure throughout the years.

Bonderizing cleans metal, gives it a rust-inhibiting surface. It produces a better base for paint. Paint is smoother, adheres more tightly. Scratches or nicks are easily refinished because rust cannot creep under an undamaged surface.

To Bonderize completely fabricated structures, Westinghouse has built one of the largest Bonderizing plants ever installed. With a smaller plant, it would be necessary to treat individual parts, then weld them together—destroying the Bonderizing seal wherever the metal was heated. Also, it would be necessary to handle the Bonderized surfaces before painting—leaving oil, grease or dirt on the metal to offset most of the good effect. Westinghouse does neither of these. Enclosures are assembled and welded before Bonderizing—the primer coat of paint is applied to chemically cleaned surfaces before they leave the Bonderizing room.

This more thorough Bonderizing is, of course, only a detail. But it is an example of many details which—added to sound design and sound construction—bring you long-time, over-all satisfaction from a purchase of Westinghouse Switchgear.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania

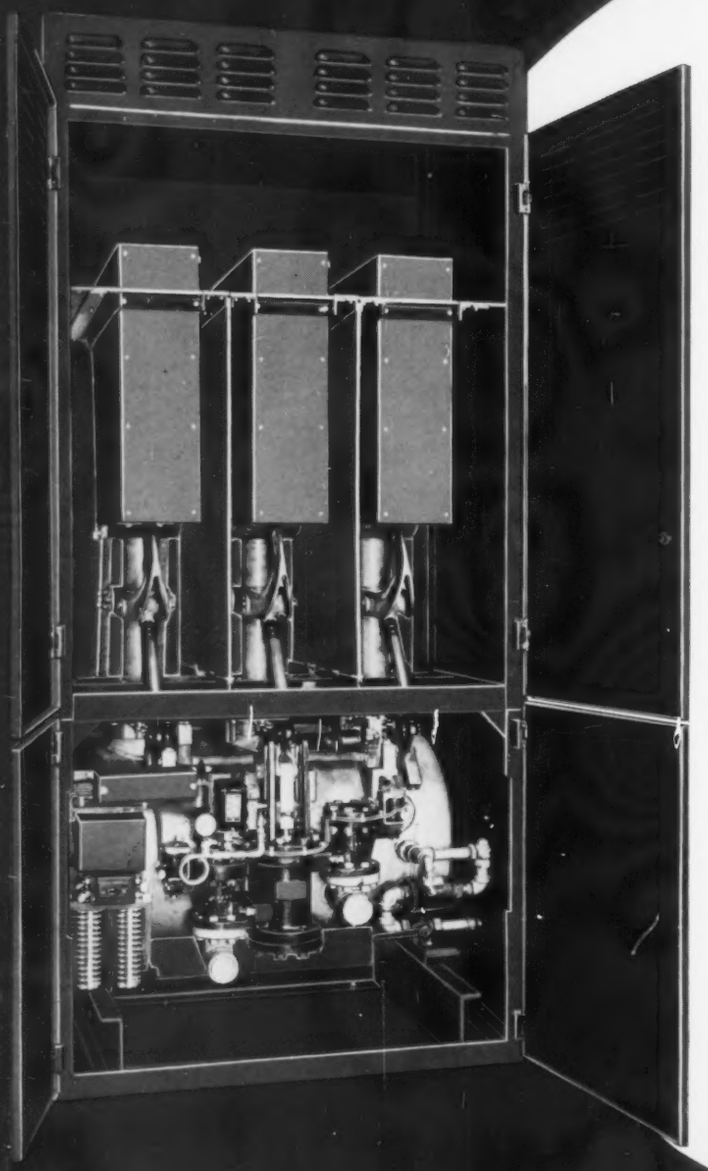
J-60472

WESTINGHOUSE ELECTRIC

Westinghouse

SWITCHGEAR

AIR



TYPE CA COMPRESSED AIR BREAKERS — Compressed-air action gives this breaker high interrupting speed. Interrupting capacities for indoor service to 2,500,000 kv-a at 15 kv, to 1,500,000 kv-a at 34.5 kv.

TYPE U AIR BREAKERS—7.5 to 15 kv—interrupting capacities to 500,000 kv-a. Introduced in 1927—hundreds in service since.

Westinghouse

GENERATING STATION TO LAMP SOCKET

breakers

FOR VIRTUALLY ANY INDOOR SERVICE

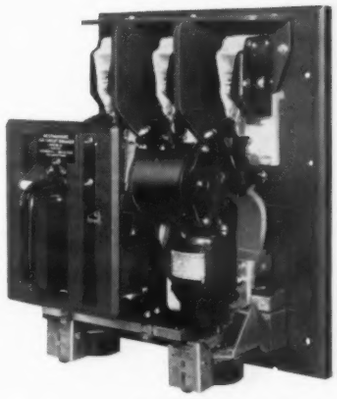
115 volts to 34,500 volts

PROVED in more than 1,400 installations of POWER breakers—over more than 14 years

If you are considering air breakers for circuit protection, here's your complete line—in five types, each built specifically for its range of voltage and interrupting capacity. One of these breakers will fill virtually any indoor requirement.

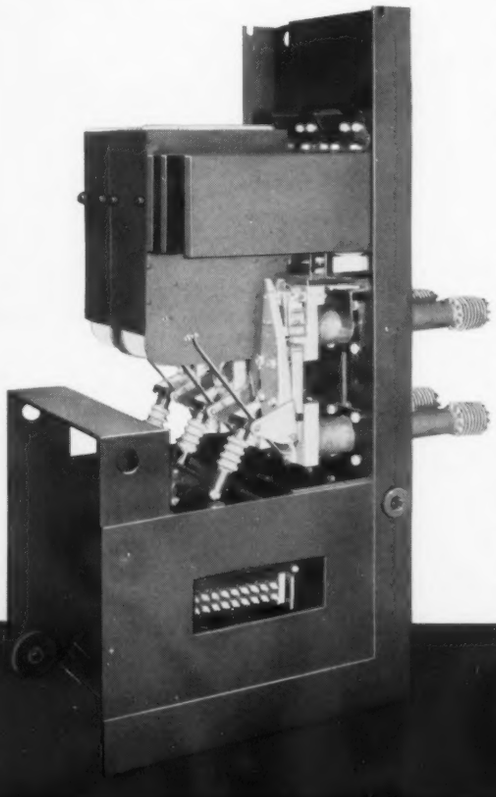
These breakers are conservatively rated. They have fast breaking action. They are sturdily built, easily and economically maintained. Most important, they have successful operating service records behind them—some dating back as far as 1927.

Westinghouse developed the first *power* air breaker. Performance of all these breakers is proved—they will meet your requirements.

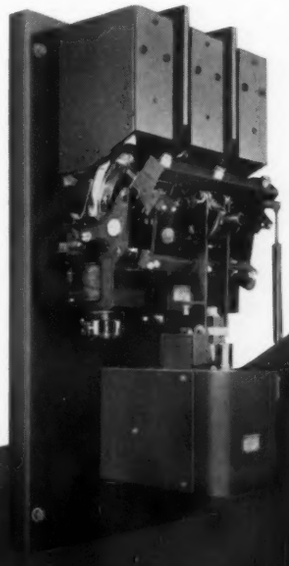


TYPE DK AIR BREAKERS—600 volts a-c, 250 volts d-c—interrupting capacities to 25,000 amperes.

For information on any of these breakers, or for help in applying air breakers in general, write Dept. 7-N, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.



TYPE DH AIR BREAKERS—2.5 to 5 kv — interrupting capacities to 250,000 kv-a. An extension of the power "De-ion" air-breaker line.

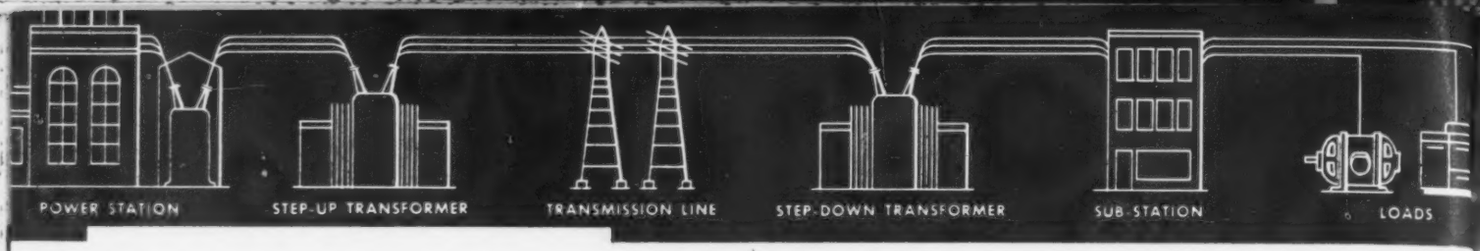


TYPE DA AIR BREAKERS—600 volts a-c, 750 volts d-c—interrupting capacities to 100,000 amperes. "De-ion" principle speeds interruption.

J-60478

Switchgear

WESTINGHOUSE



This a-c network calculator, located in East Pittsburgh, is the world's largest. It incorporates 356 separate units, including 12 generator units, 160 lines, 54 transformers, 70 capacitors, 20 special reactors and 40 loads—all of which can be adjusted to the constants of your system.

How to pre-test system expansion

Three more utilities are installing their own a-c calculators this year; all three have selected Westinghouse boards, with load adjusters, keyboard metering and other timesaving auxiliaries. You may well find that a small, privately owned board, replica of your system, will save you more than its cost by simplifying calculations, eliminating guesswork, in system planning.

How will added loads affect your system? Where should new lines be tied in—additional generating, switching or condenser equipment be located? The Westinghouse A-C Network Calculator can help you work out such problems, accurately and easily.

We claim no magic for this calculator. It does no thinking. But, by allowing you to set up your system in miniature and actually to meter lines, transformers, generators under all conceivable load conditions, it short-cuts calculations, eliminates guesswork.

During the last 12 years, several hundred power producers and users have accepted our offer to use this calculator in making studies of stability, regulation, and relay settings. Some have reported that these tests led to savings of as much as $300,000 on a single system.

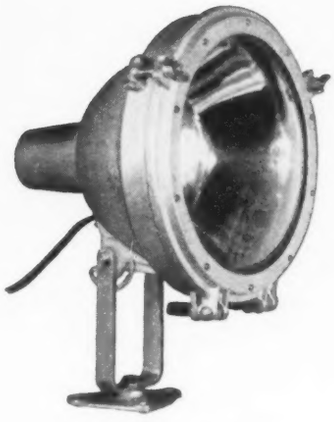
The use of this calculator is available to all utilities and large industrial users. Arrangements for its use by your engineers for a week or two can be initiated by writing Dept. 9-L-21, Westinghouse, East Pittsburgh, Pa. Because present demand is rather heavy, it is well to make reservations as far in advance as practicable.

J-60471

Westinghouse

WESTINGHOUSE supplies the answer

For both protection and night operation, a carefully engineered floodlighting system illuminates this vital pipe storage yard.



Westinghouse Type CAK, heavy-duty, cast aluminum floodlight.

FOR THE PROTECTION OF NIGHT-TIME PRODUCTION

Tonight, and every night, persons, property and production are in danger from the slinking saboteur. And as defense operations gain momentum, the need for *adequate* industrial floodlighting becomes more pressing than ever before in the nation's history.

Protective lighting creates a continuous barrier of light, a virtual wall, around an entire industrial site. With light directed away from buildings and toward fence lines, would-be intruders are blinded by the full glare, while watchmen, behind the light sources have a clear view of the approaching saboteur. Within the plant area too, yards, building approaches and alleyways are illuminated.

Your Westinghouse Lighting Distributor, with complete lighting equipment, offers the services of skilled illumination engineers to help "supply the answer" for adequate protective lighting. A new book, "Floodlighting for Protection and Production," B-2280 is available for Industrial Plant Executives. Write Westinghouse Electric & Manufacturing Co., Edgewater Park, Cleveland, Ohio.

117 Westinghouse Electric Supply Company offices and Independent Lighting Distributors provide local stocks and services.

Westinghouse Lighting Equipment

NEW THE IMPROVED CHICAGO GRIP FOR HOT OR DEAD LINES

"Since 1857"

SLIP this grip on the line—the safety latch holds it fast. It can be applied close to the pole and slid out the required distance—and it can't fall off accidentally.

The harder the pull—the tighter it holds. The Improved Chicago Grip is ideal for Hot Lines, too, giving the maximum in safety plus the maximum in convenience.

A copy of this new folder will be sent on request. Write for Bulletin 3141.

ASK YOUR SUPPLIER

Foreign Distributor:

International Standard Electric Corp., New York

Mathias KLEIN & Sons Established 1857 Chicago, Ill. U.S.A.

3200 Belmont Avenue, Chicago, Illinois

vided along with a tabulation of complete equipment for controlling a typical a.c. machine. Response, parallel operation, and line drop compensation are discussed. Schematic wiring diagrams and typical layouts aid in explanation. A sample data sheet blank is included to make sure that the necessary information is complete.

Strip Chart Recorders (646)

A 16-page bulletin has been published on strip-chart recorders, as recently developed by The Bristol Co. This publication describes these instruments, as used for measuring and recording on a 6-in. strip chart: d.c. amperes and milliamperes, d.c. volts and millivolts, pressure, liquid level, flow, mechanical motion, and for remote recording. Drawings are used to illustrate these applications. Full information is given on the measuring elements, the chart drive, type of cases and chart ranges available.

Oil Filters (647)

New descriptive literature on oil filtering equipment is announced by Westinghouse Electric & Mfg. Co. A 4-page folder describes the portable system which cleans and dries the oil used in transformers, regulators, capacitators, and similar equipment. Path of the oil through the equipment and a method of cleaning are clearly shown by diagramatic forms. Details and advantages of this oil reconditioning unit are itemized and illustrated.

Instruments (648)

Wheelco Instruments Co. Condensed Catalog, is designed to provide a convenient, condensed listing of the principal items of equipment manufactured by this company. Illustrated with pictures and cutaways showing features of various units, it also includes blueprint drawings of possible applications. On each product shown, there is a supplementary bulletin giving more detailed specifications. A partial index includes pyrometers, thermocouples, indicating, recording and resistant thermometers, switches, pressure controllers and indicators and capacitrols.

Fuse Cutouts (649)

Schweitzer & Conrad, Inc., Chicago, has issued a 32-p. bulletin, No. 215, in which the complete line of S&C Fuse Cutouts is described and illustrated, including open and enclosed types as well as the light, medium and heavy duty reclosing Cutouts for automatic restoration of service. Complete data, a reference chart and index make easy the proper selection of type and capacity.

Floodlights (650)

Steber Mfg. Co. has issued a bulletin illustrating and describing three displays of Steber floodlights and a display of reflectors and cover lights. According to the bulletin, the displays provide good opportunity for the trade to display and sell the line.

Parkway Cables (651)

John A. Roebling's Sons Co. have issued a catalog on Roebling Parkway Cables which runs 16 pages in two colors. It gives a complete description of the company's cable line and is excellently illustrated. Cutaway sections of the cable are shown together with supplementary information as to coverings and specifications. For convenience, tabular reference is available on each of the conductors. Also shown are several lighting jobs which employ Parkway cable.

Explosion Motors (652)

The new leaflet describing fan-cooled explosion resisting motors is announced by Westinghouse Electric & Mfg. Co. This descriptive data leaflet discusses the application of large motors in class I, group D, hazardous location. Ventilation and explosion resistant principles are explained, and motor parts are described. Frame size and horsepower data for use on three-phase, 60-cycle lines are given together with physical dimensions and sections viewing a 32-frame motor.

EASY WAY TO GET INFORMATION

To keep posted, simply circle the items in which you are interested, cut out the coupon (it can be pasted on the back of a postcard) and mail to:

ELECTRICAL WEST, 68 Post St., San Francisco, California

Please send me the following CIRCLED items:

600	601	602	603	604	605	606	607	608	609	610
611	612	613	614	615	616	617	618	619	620	621
622	623	624	625	626	627	628	629	630	631	632
633	634	635	636	637	638	639	640	641	642	643
644	645	646	647	648	649	650	651	652		

Name..... Company*..... Title*.....

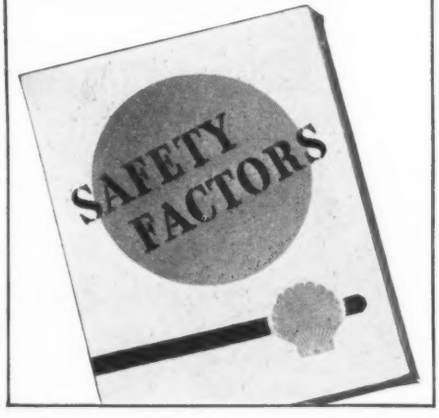
Address

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

I feel kinda guilty sometimes...

SHELL'S SAFETY FACTORS PROVIDE

- **Better control of friction heat**
- **Better control of combustion heat**
- **Slower rates of wear**
- **Increased power off-take**
- **Savings on shutdown losses**
- **Reduced outlay for lubricants**



LIKE THE OTHER DAY, when a mining outfit gave ME the credit for solving a carbon deposit problem in their compressors.

But as a matter of fact, that problem was solved long ago at the "University of Petroleum," Shell's $3,500,000 research laboratories, where 821 scientists and their assistants are forever finding the answers with real improvements in lubricants.

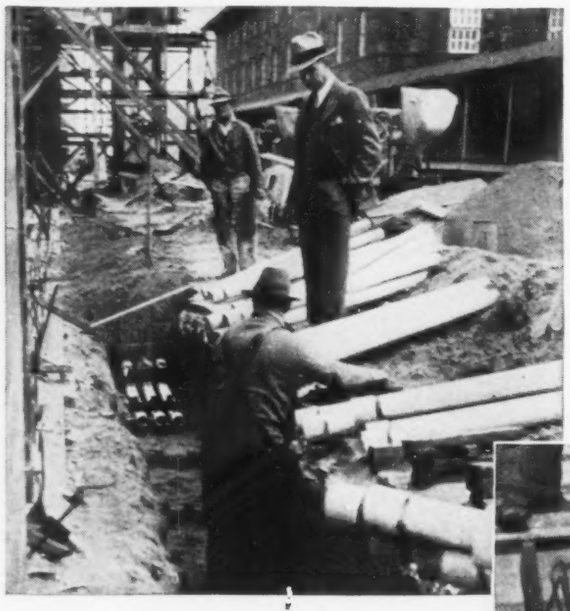
Maybe we Shell salesmen are plain saps for not pretending that we ourselves are "*big-shot lubrication engineers.*" That seems to be the popular way of selling industrial lubricants today.

On the other hand, as my old Pappy used to say, it ain't what you claim to be, *it's what you deliver* that counts. And I gotta say that the SAFETY FACTORS "INSURANCE" provided by Shell scientists sure delivers!

If you haven't investigated our SAFETY FACTORS, give me a call. I promise you some money-saving information.

Your Shell Salesman

WHEREVER CABLEWAYS ARE *COSTS GO DOWN* WITH



ON ALL TYPES OF SYSTEMS—above or underground, exposed or concreted-in—engineers throughout the country specify Johns-Manville Transite Ducts. On transmission and distribution systems of every description, these modern, asbestos-cement ducts make important contributions to greater efficiency and operating economy. It will pay you to check the reasons why, as outlined on these pages.

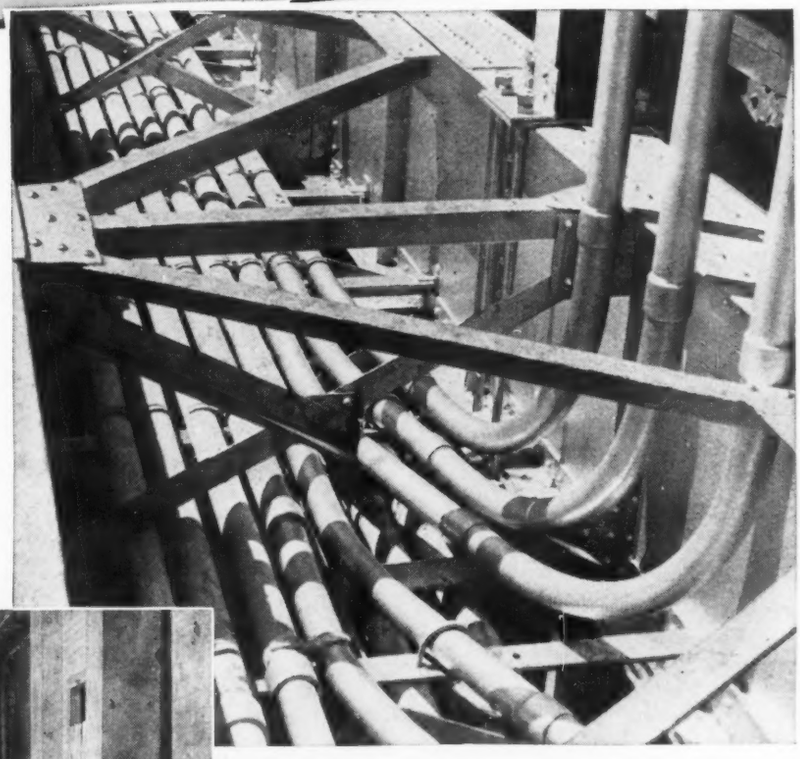
LINES ARE LAID FASTER—Transite Ducts are light in weight and easy to handle. Lining up is fast and accurate. Where an encasement is required, the long lengths of Transite KORDUCT cut down on spacers, mean fewer joints. Underground, Transite CONDUIT—thicker walled, otherwise identical—is so strong it needs no protective casing of any kind. On exposed work, Transite CONDUIT requires no screwing or threading operations. And both types of Transite Ducts have a permanently smooth bore that assures easy cable pulls.

SYSTEM CAPACITY BOOSTED—Another important advantage of the asbestos-cement composition of Transite Ducts is their high rate of heat dissipation. This feature results in greater system capacity, or lower cable operating temperatures that provide decreased copper losses and longer cable life. On heavily loaded cables, the savings in I^2R losses alone represent a sizeable return on the investment in Transite Korduct.

JM PRODUCTS

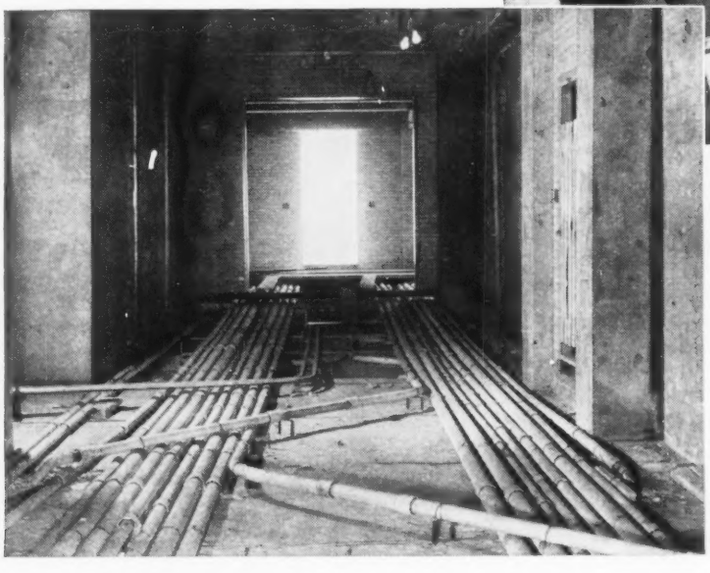
Johns-Manville TRANSITE

LAID... *DISTRIBUTION* J-M TRANSITE DUCTS



MAINTENANCE STAYS LOW

—Transite Ducts contain no metal or organic materials—they will not rust or rot. Underground, Transite Conduit's high resistance to aggressive soil action means long, virtually trouble-free service. It maintains its uniform strength and true form under sustained earth loads and traffic pressure. And on exposed locations, this durable duct safely withstands the destructive action of weather, smoke and fumes.



NO SMOKE OR FIRE

—Made of asbestos and cement, Transite Ducts cannot burn under any conditions . . . actually provide the equivalent of extra fire protection between cables. When burnouts occur, systems are safer, for damage to equipment is minimized. With single conductor, lead-sheathed cables, closer spacing may be used to give equivalent fire protection, resulting in lower induced sheath voltages. And Transite Ducts will not contribute to the formation of fumes or combustible gases.

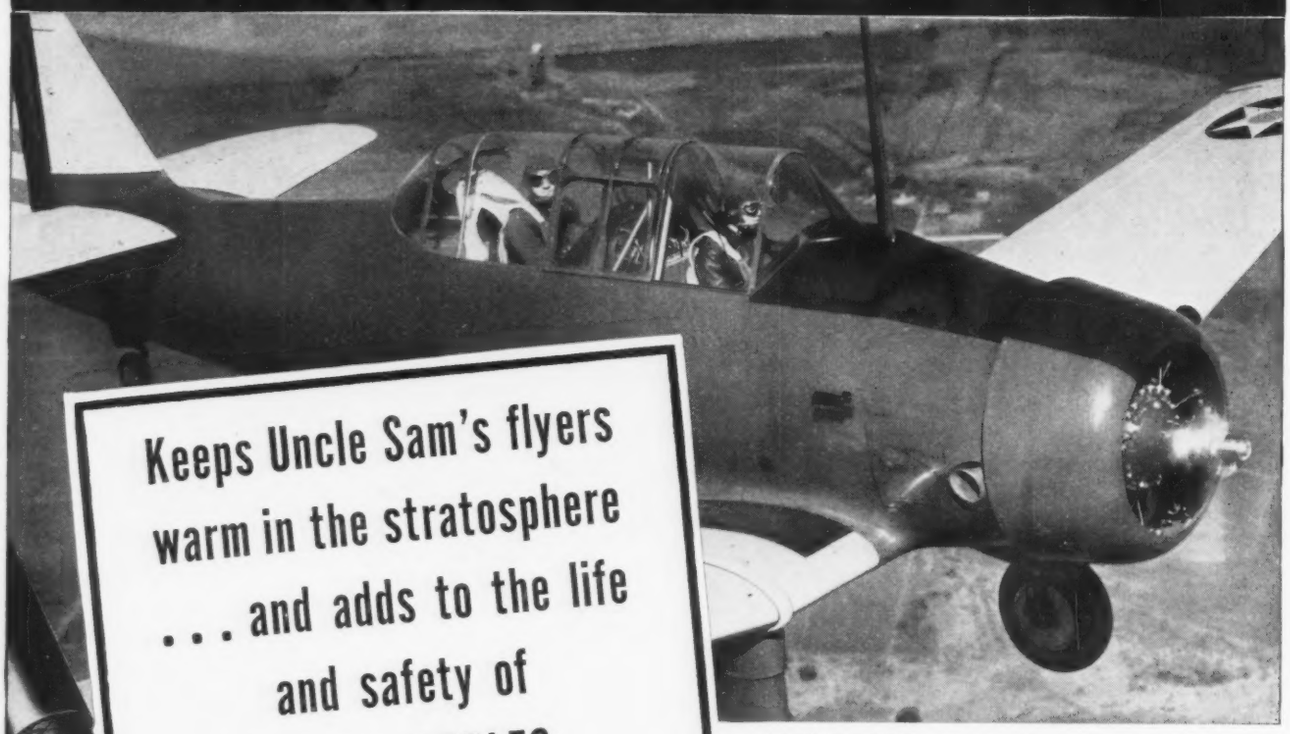
For complete details on the many ways J-M Transite Ducts can help you distribute power for less money and with greater efficiency, write for brochure DS-410. Johns-Manville at Los Angeles, San Francisco or Seattle.

DUCTS

Transite Conduit—for exposed work and for installation underground without concrete encasement.

Transite Korduct—for installation in concrete. Thinner-walled, lower-priced, but otherwise identical with Transite Conduit.

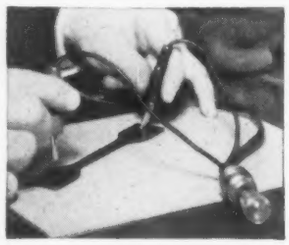
CONDUCTING RUBBER makes it possible . . .



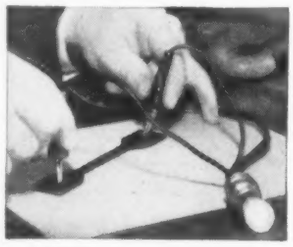
Keeps Uncle Sam's flyers warm in the stratosphere . . . and adds to the life and safety of POWER CABLES

FLEXIBLE STRIPS of conducting rubber concealed in a new undersuit heat up like wires in a toaster; keep army stratosphere flyers warm at 60° below zero.

American Steel & Wire Company's Type PS Semi-Conducting Shielding (Conducting Rubber) eliminates electronic ionization of air gaps and adds years of service to the life of power cables.



THESE PHOTOGRAPHS taken in our laboratory show a 15 watt bulb being lighted by the flow of current from a 110 volt plug-in, through an ordinary "dumb-bell" sample of conducting rubber. These tests indicate that a wide range of conductivity in rubber is available, and this conductivity can be varied to suit the best design of the cable.



ORDINARY types of power cable shielding have one outstanding weakness. Bending the cable during installation or thermal expansion and contraction in service tends to separate the shielding from the underlying insulation—thus producing air gaps. At every point where such air gaps occur, gradual disintegration of the insulating compound results—and the life of the cable is reduced.

Now, American Steel and Wire Company's development of Type PS Semi-Conducting Shielding prolongs cable life by overcoming this difficulty. Type PS Semi-Conducting Shielding is always in intimate contact with the cable insulation. It is as flexible as rubber because it IS rubber—conducting rubber! When used with rubber insulation, Type PS Semi-Conducting Shielding not only adheres to the insulation, but becomes an integral part of its surface.

The problem of producing conductivity in rubber compound without sacrificing flexibility or other rubber-like properties has finally been solved. And we now offer a proven, thoroughly tested conducting rubber compound for use in power cable construction. Write today for more complete information.

COLUMBIA STEEL COMPANY, *San Francisco, Pacific Coast Distributors of U·S·S Electrical Cords and Cables*

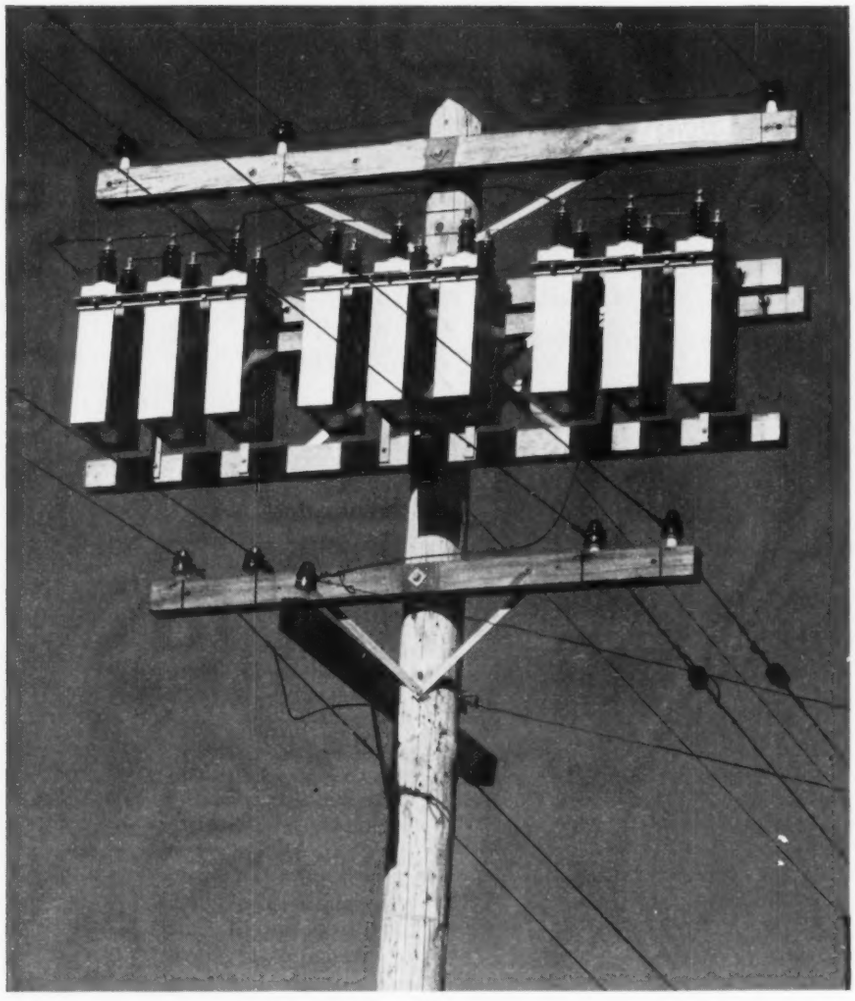
Manufactured by

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*

United States Steel Export Company, New York

UNITED STATES STEEL

FAST CAPACITORS



Your BUILDING MARGIN, the extra reserve capacity of your system, may look very narrow in these busy days.

You can increase your system capacity quickly and economically by reducing the reactive KVA in the distribution system. Higher power factor, improved voltage regulation, a greater building margin are yours with FAST CAPACITORS.

Investigate the economies possible with FAST pole type units, designed, manufactured and tested by specialists.

JOHN E. FAST & CO.

CAPACITOR SPECIALISTS FOR 22 YEARS

3123 NORTH CRAWFORD AVENUE CHICAGO, ILLINOIS

West Coast Representatives: WALTHAM, DE WITT & KRUSI, 630-632 Monadnock Building, San Francisco, California

ELECTRA'S HUSBAND

Right from the Front

ELECTRA'S frequently expressed wish for direct word from someone in the industry in England has been gratified. Thanks to Dave DeBard of Stone & Webster, she has read the intensely interesting letters sent by some of his friends in and about London. Here are excerpts from one such letter that Electra particularly commends:

"Rationing, of course, is more rigid since I last wrote you. The meat ration has been cut, and several other foods included, but one way or another we seem to carry on. Actually, of course, we have not the ships to carry all the food and munitions we want after allowing for sinkings. . . .

"While on the subject of rationing, our electrical areas have been running demonstrations in our showroom cooking kitchens on wartime cooking—how to use substitutes for sugar, eggs, meat, etc. These have been run in conjunction with the Ministry of Food and have been extremely popular. . . .

"The 'Kitchen Front' these days is something which gets quite an amount of publicity. We have now started something called 'The Kitchen Front Club' which we think, as soon as it gets really going, will be a success. . . .

"The War Savings Campaign is another thing we have taken up. We have a scheme whereby employees save a certain amount each week for a given number of weeks. The money is pooled and with this a number of war certificates are purchased each week. These are drawn for by numbers. For instance, someone subscribing, say, 1/—(25c American) per week, could, if they happened to be one of the lucky ones, get a 15/—($3.75 American) certificate the first week of the cycle. I think this is an added inducement to the members of the staff.

"The showrooms in our areas run War Savings Groups. We felt that people, when paying their accounts, might like to put the change, if any, into savings stamps whereas they might not bother to go into a post office to buy them. Another thing we do, on occasion, is to give our advertising space to help War Weapons' weeks, etc.

"All of these things we feel are just a little something that we can do to help win the war in addition to our more direct efforts in generation and distribution of electricity.

"The majority of our staff, in addition to their work here, do voluntary night work in the form of Air Raid Wardens' duties, Home Guard, Nursing and First Aid, Auxiliary Fire Fighting, Fire Watching, etc. Some of the girls give two or more nights a week doing Red Cross nursing work in the Underground Railway and other shelters.

"More or less everyone now does a certain amount of fire watching each week. The schemes vary. In some districts the fire watch is changed every two hours, the total number of hours of duty per month being 48 or more. In others, one whole night a week fills the bill and so on. In the Home Guard most weekends are given up for training, etc., that cannot be done in the evenings, plus a night duty guarding important points. The Air Raid Wardens in most districts have been doing very excellent work and still are, especially in the badly blitzed areas.

"Arrangements are now being made to train women for meter readers, electricians, etc. It would be difficult to find women already trained for these jobs so schemes are being gotten out to train them in the different areas. Of course, quite a number of jobs that used to be done by men such as bus and tram conductors, railway porters and cleaners, etc., are now mostly filled by women and I must say that they seem to do them extremely well.

"We have had many cases of our overhead and cable systems being damaged and some amazing cases of loyalty to duty. Only the other day I had quite a few cases reported to me. We had some of our men working on an aerodrome site when they discovered an unexploded bomb. The man in charge, without hesitation, removed this by dragging and rolling it some 60 or 70 yards away. The work on which these men were engaged was of a most urgent war nature. In another case there was work being carried out in a very closely guarded area which has been specially prepared to offer lots of surprises to the Germans if they land (so you can imagine there is danger in plenty in any event), the men were working under these hazardous conditions when a bomber dived out of the clouds, dropped five bombs which exploded within 100 yards. The men worked on throughout this and finished the repairs and then as they were leaving a low flying German fighter raked their car with machine gunfire, which was repeated a few minutes later—so much so that the men had to climb the car on to the curb and take cover under a wall. At this time weather conditions were very trying as there was a high easterly gale with heavy rain and the men were unable to get anything to eat or drink for well over six hours.

"I should think your engineers would be interested to know that although we, with our widespread interests, have had cases of damage to the transmission and distribution systems, we have been able, by planning in advance, to have stocks of spares and mobile gangs ready at strategic points and these have been successful in keeping the interruptions to the industrial and domestic customers to the minimum. In very few cases has the supply been out, however isolated the district, for more than 12-15 hours. Even the farming community with their milking machines, sterilizers, incubators, etc., have had no trouble. We have had, I think, a couple of cases but it is a fact that the fears which these people had as to interruptions have not been realized. . . .

"We have just had published in the papers the fact that in the big fire raid on London at the end of December there were no less than 1,780 fires in the confined city area.

"Our heads are somewhat bloody but still unbowed. We have our tails up and are hitting back and hope to do this in increasing degree as more and more materials are available to us."

Realistic as she is, Electra doesn't think this country will ever have to take that kind of punishment so she insists that we should send overseas all the help we can.

"Everyone is talking about protective lighting around industrial plants these days," Electra commented the other night, "but my kid sister has a new angle on it. She says protective lighting in her case is the 300-watt floor lamp she leaves on in the living room while entertaining a wolf."

ALUMINUM, DEFENSE, AND YOU

ALCOA

3

IT IS EASY TO UNDERSTAND ABOUT ALUMINUM AND DEFENSE

THE WHOLE THING BOILS DOWN to two simple questions:

1. **How much aluminum** are America and England going to need? There is only one answer: The democracies must have *all the aluminum it takes to win,* and nobody knows how much that is.
2. **How fast** is aluminum needed? We don't know, for sure, but just as fast as the aircraft plants, munition plants, shipyards, and the like, can be expanded to use aluminum and other materials for defense purposes.

THOSE IN AUTHORITY IN WASHINGTON are putting together, day by day, expert estimates of what all these defense industries are going to need, month by month, clear to the end of 1942. These estimates, as issued, are our book of rules.

FOR MONTHS WE HAVE BEEN, and are now, delivering aluminum for defense purposes far in excess of that called for by prior estimates.

DEFENSE IS NOW TAKING from us over 40 million pounds a month. Every American ought to have a picture of just how much aluminum that is; here it is:

Peace-time America, during the nine years from 1930-8, could find use for only 14 million pounds a month from us.

In the busy year of 1939 we had to make only 27 million pounds a month to satisfy the civilian needs of this prospering country.

Suddenly, defense alone needs 40 million a month! 14 million (civilian), to 27 (civilian), to 40 (defense) and soon to 50 and beyond!

★ ★ ★ ★

YOU CIVILIAN USERS of aluminum are grand people.

THE WAY YOU ARE DOING WITHOUT aluminum until producers can catch up again with civilian uses is typically American. We are sincerely grateful for your understanding.

IN THIS RECESS you are having to scramble for **RECESSITIES**—other materials which just don't fill the bill 100%, because there is no pat substitute for aluminum.

IT'S TOUGH ON YOU and it's hard on us to have to turn away temporarily from the friends and pursuits of a lifetime.

WE HAVE NOT TURNED OUR BACKS!

WE INTEND that no civilian shall have to forego the things aluminum can do best one minute longer than we can help.

ALUMINUM COMPANY OF AMERICA

"We've been trying to get him to go home for weeks, but he won't believe it's night since we put in the new G-E Fluorescent Lighting!"

YES, THIS PICTURE, we admit, is a trifle far-fetched. But the fact is that customers who have installed *really* good lighting are continually amazed at the greater ease with which they can work and the better results they get.

Human beings, accustomed for ages to daylight outdoors, quickly sense improvements of lighting indoors and respond to them favorably in many ways. As indoor lighting approaches outdoor lighting, seeing becomes easier.

Today, although it is still impractical to provide daylight levels indoors, it is possible to

get as much as 50 footcandles or more . . . thanks to modern light sources and equipment. The more 50-footcandle installations that are sold, the closer we come to the goal of providing better light for better sight.

Fifty-footcandle installations are not hard to sell when you dramatize some of the fundamental Science of Seeing Facts for your customers. For example, how recently have you told your customers:

THAT *more than twice as much light is generally needed to read the stock market reports in a newspaper as is required to read front page news?**

THAT *handwriting in pencil usually requires nearly five times as much light to be as readable as the same handwriting in ink?*

THAT *merchandise displayed in good light sells faster than merchandise displayed in poor light because people can actually see it more quickly and decide faster?*

When you sell the man who runs a factory, store, or office, tell him that modern lighting is a powerful force that few people have even begun to use to full advantage. Show him how the additional expense of a 50-footcandle installation can be returned many times over in the form of reduced errors, increased sales or production, better, faster work with less fatigue, improved employee morale, and reduced accident hazards.

HAVE YOU JOINED THE FORTY-NINERS' CLUB?

The honor of membership in the Forty-Niners' Club is extended to any salesman who has been primarily responsible for selling an installation of 49-footcandles or more, or to any executive who works under 49 maintained footcandles. For full information, write to Secretary, Forty-Niners' Club, General Electric Company, Nela Park, Cleveland, Ohio . . . or consult your G-E Lamp Division for further details.

* See Chapter V, "The Science of Seeing" by M. LUCKIESH and FRANK MOSS.

FREE sample of "The Seeing Spinner!" A new gadget to help show how bgter lighting speeds seeing. Write to General Electric Co., Dept. 166-EW-F, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS
GENERAL ELECTRIC

Made to stay brighter longer

MAZDA . . . NOT THE NAME OF A THING, BUT THE MARK OF A RESEARCH SERVICE

ELECTRICAL WEST

VOL. 86 NO. 6
JUNE 1941

OUR INDUSTRY LOOKS AHEAD

By C. E. HOUSTON
President, PCEA

IF THE FAST MOVING events of recent months—and even of recent days—may be taken as a criterion of the increasingly important place of the electrical business in the world today, we will have to move rapidly here to keep abreast of our convention theme, "The Electrical Industry's Contribution to Progress." Time was when we counted our progress in years. The record now is on a daily chart.

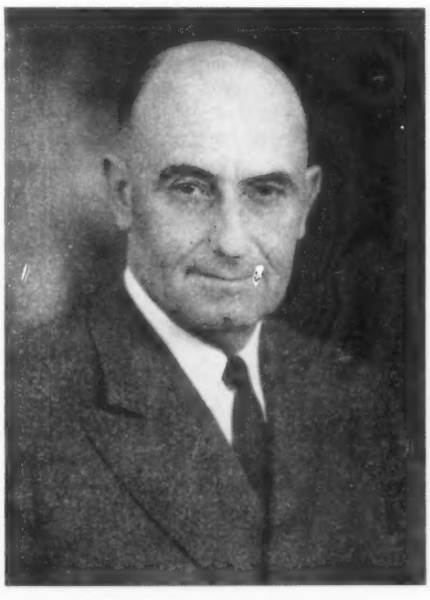
New and extended demands have been made—are being made—on all branches of the electrical industry and on the men who guide its affairs. There is a job to be done. Our industry, the power behind the defense production program of the nation, is geared for its biggest task and we have hit high speed!

The world situation today introduces many new problems. For those engaged in production there are the problems of priorities; in research, the problems of finding suitable substitutes for raw materials that are no longer available; and in management, the problems of inventories, distribution, price stabilization and taxation. The answers to these problems are not to be found in past experience but must be reached by clear thinking and intelligent planning. They call for a mutual understanding of each other's problems, and a co-operation in arriving at their solution. They call for the harmony which is so earnestly the desire of every American today.

We have just reason to be proud of the electrical industry. In the span of one normal lifetime it has grown from its humble beginnings to become what is, in all probability, man's most indispensable ally and assistant. And we do not know, nor can anyone guess, what further developments lie ahead. It is reasonable to predict that present defense research may develop much new and now unknown equipment and appliances. It shall be our responsibility to utilize these to the fullest extent in order that an ever-increasing number of people may find greater uses of electricity in more and wider fields at an ever-decreasing cost, both for the service and for the wiring and equipment through which the service is utilized.

Most of you will recall that our greatest and most spectacular progress has been achieved since the last war. People underwent a psychological change, their conservative adherence to old habits and old methods was brushed aside, and research was given free-rein. We not only achieved improvement of then-existing products, but many new and previously unheard of uses for electricity were developed. Consider how many of the things which are today a part of our everyday life were unknown twenty years ago—electric clocks, radio, electric razors, electric refrigerators, television. And as evidence of the fact that our industry is still a virile youth, growing and seeking new fields to conquer, I call your attention to the recent developments in the fields of gaseous tube lighting.

HOUSTON



There is nothing of startling newness in these observations, but they bear review and reiteration for the message they hold for all of us that we must tune ourselves to the progress which our industry is making if we would not have it grow out from under us, and leave us wandering aimlessly in a maze of out-moded traditions while those who are more adaptable to change move on to greater and greater accomplishments. These reminiscences are offered also as an encouragement and incentive to the young people in our industry—to them I wish to say, remember, always, that there is nothing static about the occupation in which you have engaged. Let us not allow ourselves to get into the deep ruts of complacency. Let us keep ourselves constantly alert to the possibilities of better methods of doing the jobs to which we are assigned. Competent performance offers reasonable assurance of our continuance on our present job, but it is initiative which carries men on to greater responsibilities.

And that brings us again to a recognition of the important function which can be performed adequately only by an all-industry organization such as this association. No one company, nor any one branch of the industry, can function efficiently as an isolated unit. In the spirit of the times one may compare it with an army, with its mechanized units, its air corps, its artillery, its engineering and intelligence services, etc. Each of these units must function individually to a high degree of efficiency; but beyond that is the absolute necessity for a coordinated, harmonious working together, or disaster will result. It is not only natural but highly desirable that each unit should be firmly convinced that it is the finest of all, and the most essential to ultimate victory—that is the pride which carries men to great ends. But this pride must reflect itself in a spirit of co-operation toward the ultimate achievements of all.

And so it is with our industry. Whether you represent the contractors, the manufacturers, the inspectors, the wholesalers, the dealers or the utilities you are also a representative of a great industry which can only render

its potential public service to the maximum degree if each branch has, in addition to its "unit" pride, a strong sense of *industry* solidarity. From sheer self-interest, if for no other reason, this attitude should be developed to an ever greater degree. There is no branch of the industry strong enough to enjoy the full fruits of its efforts while playing a lone hand; but, under a coordinated program, as each goes forward it carries the others along.

Now we in this industry are prone to talk to ourselves too much, and we overlook many opportunities to bring before our friends and the public generally just what the electrical industry does in the interest of society and the economic progress, the burdens it bears, the contributions it makes. To me, this is an individual opportunity and responsibility, for without our individual loyalty, knowledge and enthusiasm—given voice by our own people, how will the public learn of this great force at work in the community?

If you are inclined to think that your own personal, individual attitude does not count for very much in the general course of events let me tell you of the incident I witnessed recently when a street car jumped the track in an intersection. It was only one car in the entire transportation facilities of a large city yet because it got off the track, it tied up scores of other cars, hundreds of automobiles, and a thousand or more workers who, because of the delay, were late in getting their own work underway that day. Just one trolley car—but it was off the track. I have seen the same thing happen in an organization. One man, off the track, out of spirit with the policies and character of the house, has delayed, held up, lost much business and good will for his firm. One man off the track, and the traffic of the organization is disrupted.

A particularly timely illustration of the industry's adaptability to emergency situations is brought forcibly to our attention by the defense program. You are aware of the great surge in the demand for electric power. New industries have sprung up and old industries have expanded to double and triple their production capacity. Plants that were working one shift a day are now operating two and three shifts. Power, more power, and yet more power is the demand. And that demand has been met steadily and "on sight" by the utilities. Normal excess capacity and normal current expansion have been augmented by speeding up the completion of capacity that was planned for future development. And as a further safeguard a series of interconnections has been established between the companies over which an emergency shortage in one area may be met with power transmitted from a section which has reserve capacity.

It is my greatest hope—and I know that you share this with me—that while we as an industry are driving with every force at our command toward the goal of complete and adequate national defense, we will be enabled through the genius and the resourcefulness of the men of our industry to lead the way to industrial and economic stability when the days of peace come again. The preparation for peace is a serious problem. Though the arena of conflict widens, though the time of peace seems far away, we of the electrical industry know that industrial capacity for leadership will be called on for that leadership in the days to come, no matter how long postponed those days may be.

The electrical industry has gone through fires before, and has emerged with the banners of leadership flying. We are organized for leadership, we have the basic understanding of what leadership demands, and we have vision.

"Where there is no vision, the people perish," the Scriptures say.

We must keep our vision—the electrical industry looks ahead!

Photo by U. S. Army Signal Corps

THE ISSUES ARE CLEARLY DEFINED

By C. J. STRIKE
President, NWEL&PA

ANOTHER milestone has been passed, and we find ourselves in a world of confusion, witnessing the challenge of nations of totalitarian form of government versus democracy —and within our own country, witnessing the challenge of our past philosophies concerning the position of government to the individual and to fields of private enterprise.

The issue of totalitarian government versus democracy is clearly defined, and the great majority of our people stand ready to sacrifice their lives, if need be, to maintain our democratic way of life and those things which have made this country the greatest nation on earth. On the other hand, the challenges within our country are not clearly defined, and the great majority of people, generally, do not understand the direction of the trends or the distance we have progressed in those trends. These internal controversial issues must be understood and disposed of if we, as a nation, are to meet the challenge of national preparedness, and at the same time adjust ourselves for the economic conflict which will confront us when the armed conflict comes to a close.

One of the major subjects of controversy, and in my opinion a major factor in our economic welfare, is the effort of the federal government to force the privately-owned light and power industry into some form of government ownership. The greatest challenge confronting management of the industry today is to clarify the issues in this controversy, to the end that the question may be settled with intelligent

understanding along sound economic lines.

Unfortunately, the social reforms which would be thrust upon our industry are beclouded by the prejudices which followed the collapse of 1929. Surely it is not necessary to turn the second largest industry in this country over to government ownership to correct errors which may have crept in during the pioneering era through which our industry has passed. While we do not claim a perfect record, yet from a humble beginning slightly over a half century ago, we in this country have built a light and power industry, the standards of which are the envy of the entire world. Our industry has never asked for government aid in meeting the obligations of service, and, in addition, it is now contributing more than $1,000,000 per day in taxes to meet the costs of government and national defense.

The experience of providing electric service for a rapidly growing country has been one of constant change. First, we had the local isolated plants serving one community; next came the period of consolidations within economic transmission distances; and finally, the joining together of entire units into integrated systems throughout widespread geographic and industrial areas. Each of these changes took its toll in obsolescence of equipment, yet each change resulted in an improvement and expansion of service, with a constant reduction in the cost to the consumer. Thus, the record reveals that these changes were very much in public interest.

One of the major problems from the beginning has been the securing of new capital to finance the facilities to meet the constantly increasing demands for service; and the adequacy and the reliability of electric service has always been one of the major economic necessities in the progress of any community.

Today we are confronted with compliance with the Public Utility Act of 1935, and two logical conclusions should be asked:

First, was such a drastic act justified?

Second, is full compliance with that act in public interest?

It is the common understanding of most people that the Public Utility Act of 1935 was designed as a "death sentence" for what politicians have chosen to call holding companies. To me it means a death sentence, as well, for the small operating company. I am not so much concerned with the effect of the Public Utility Act of 1935 on the parent companies and their large subsidiaries serving industrial areas, where the volume of business in a closely congested area is sufficient to attract capital from the investing public, as I am with its effect upon the small operating companies serving vast areas where the volume of business is entirely inadequate to attract new capital from the investing public at low rates of interest comparable with the rates at which the larger companies can borrow.

An analysis of the past reveals that during the transition from the period of local isolated plants to the period of integration within logical geographic areas, a major factor has been the inability of the small operating companies to attract the necessary capital to finance the expansion of their facilities, with the result that those companies were confronted with the necessity of readjustment of corporate structures to meet the requirements of the investing public. These requirements were threefold:

First, the physical and corporate integration of properties within logical geographic areas, in order that the operating companies could enjoy the benefits of large-scale production and the diversity of use within those areas.

Second, the gathering together of several operating companies into some form of common ownership, to the end that their aggregate gross operating revenues would result in a sufficient volume of business, diversified as to territory, so that the problems of one company would not materially affect the financial stability of the group as a whole.

Third, centralized management near the financial centers as a source of information for investors.

Such were the requirements of the investment public. Except as small operating companies adjusted themselves to meet these requisites, they could not have, in many instances, secured their capital and, in most instances, could not have secured the low interest rates on their bonds, and the necessary equity money through preferred and common stock participation to enable these companies to compete in rates with the companies operating in the more densely populated industrial centers.

Thus, there came into being what were originally called "parent companies," whose function was to unscramble the affairs of the local isolated companies, clear the titles, licenses and franchises, and secure the necessary capital not only to finance the then existing properties, but to provide a source of new capital for additional service facilities. It must be remembered that the need for this type of organization originated in the operating companies' territory due to the necessity of attracting low cost money to meet imperative service demands which often bordered on emergencies.

STRIKE

It is a recognized fact that the investment in new facilities necessary to serve this business is on approximately a five-to-one basis, and if we are to meet the constantly increasing service demands and attract the necessary new capital required by the operating companies, we must maintain a type of organization which meets the requirements of the investing public. In my opinion, it is impossible for a company operating in the isolated areas, with no connection with the large financial centers, to meet the low cost new capital requirements of the future by appealing to "main street," for the people in these areas are not investment minded, and sufficient capital is not there to be had. In the final analysis we must continue to secure the major part of the capital for this constantly growing industry through regular investment channels, and I cannot conceive it to be in public interest to force the small operating company to sever its corporate relationships provided by the holding company system, when it can be conclusively proven that such a system has provided the new equity money required by the operating companies, at reasonable rates of interest, and without a single emergency which has required the use of taxpayers' funds to meet these new capital requirements.

There are those who say that, while benefits did accrue in the past, the demand for holding company organization no longer exists. When we realize that for each dollar of additional annual revenue which an electric company receives, it is obliged to increase its investment approximately five dollars, it is pretty obvious that the problem of providing funds to meet these requirements will always exist in every pro-

gressive electric company. If the facts of the past quarter century could be reviewed without prejudice, we would find that the same problems exist today which brought the parent company system into existence, and in public interest it should not be destroyed.

Management in our industry, for the past decade, has been on the defensive, and has been the victim of most vicious public attack by those who would change the privately-owned light and power industry to one or another form of government ownership. Does anyone believe that, had government been charged with the responsibilities of the past half century in developing this industry, it would have been done more economically or with greater dispatch? Does anyone believe that if the industry were turned over to the government today, that government would do a better job of outguessing the future than we have in the past? Does anyone believe that the industry's total tax bill, in excess of $400,000,000 annually, is not a most potent factor in meeting the costs of government and relieving the burden for individuals?

To me the issue is very clearly defined, and I am convinced that an unbiased analysis of the past will vindicate the principle of diversified corporate ownership and physical integration of service facilities as the most practical method of financing and operating the light and power industry in this country. If abuses have crept into this system, then those who so contend should recommend improvement rather than destruction. I call to mind the slogan of one of our American automobile manufacturers — "Constantly improving, but never changing the model."

I wish to take this opportunity of complimenting the operating companies in the Pacific Northwest on doing an outstanding operating job under most trying circumstances. I feel that the Northwest Electric Light & Power Association has served as a medium for exchange of ideas which have been mutually beneficial. It is my sincere wish that during the ensuing year, management will come forward and prove its stewardship of the past and its right to continue to own and operate this business in the future. Surely an industry which has brought about the highest standards of electric service for any nation on earth cannot be completely without honor, and I, for one, believe that when the experiences of the past are reviewed without prejudice, we can make such corrections as may be necessary and in the public interest, without destroying the chassis on which this great industry was built. I remind you of the old adage, "If there is merit to your contention, it can be sold."

WITH AN EYE TOWARD THE FUTURE

By G. B. BUCK,
President, R M E L

WAR CLOUDS have not overshadowed the unending procession of electrical league activities in the Rocky Mountain area. Spurred by a national award of the American Trade Association Executives for "stimulating the use of members' products and effectiveness in meeting competition," the league is now well on the second lap of its 1941 program, which promises to excel its 1940 achievements for an all-time high. During May, League Manager George E. Lewis went to Washington to receive from Secretary of Commerce Jesse H. Jones a well-merited Award of Honor on behalf of the league. The honor likewise extends to Mr. Lewis for his part in winning, against the stiff competition of scores of trade organizations throughout the nation, most of them national in scope. The Rocky Mountain Electrical League has now captured two awards of this sort.

The league as a body is now engaged with plans for joining in the National Defense movement. This far-reaching project is still in the laboratory stage, but its details, scope and objectives are expected to be ready for release shortly. The league has long collaborated with Federal, state and city governments, through its technical, accounting and commercial forces. The league's new program, it is planned, will be an even longer step in this direction.

During the year under review, the league's 12-point program has demanded so much time and attention that the customary, periodic, all-industry gatherings of the organization have been suspended in favor of committee, section, and divisional conferences. Scores of the league's most capable members have given of their time for planning and carrying out comprehensive programs. Engineering and accounting, as well as fluorescent lighting, the Better Light-Better Sight program, Adequate Wiring and other activities have claimed day and night attention of League members. More than 900 persons attended a recent combined lighting, engineering and accounting clinic, in Denver. Though the geographic boundaries of the league are confined to three states and a fraction of a fourth state, electrical contractors, lighting experts, engineers, accountants, managers and others from eight states foregathered in Denver for the spring get-together.

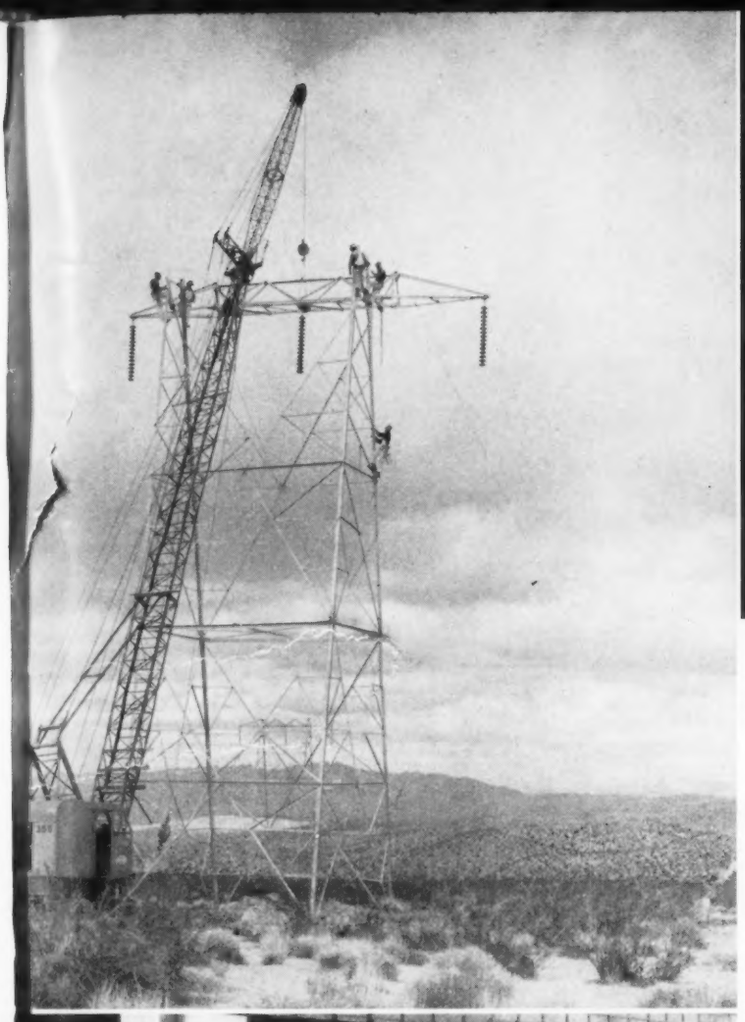
Under the direction of F. R. Jamison, chairman of the league's advertising committee, the most comprehensive Adequate Wiring promotion campaign ever attempted in the Rocky Mountain region was launched during the latter part of April and early in May. Practically every utility member company and many dealers, contractors and distributors joined in a newspaper advertising program that is expected to reach more than 1,000,000 persons, the league providing mats, plates and other advertising material. The radio, too, is being widely used, likewise company publications. In Denver, the Public Service Company of Colorado is just completing one of the most spectacular lighted billboards, which conveys the adequate wiring message to hundreds of thousands of passers-by.

The street and highway lighting committee of the league has become one of its most potent units. The committee is not only promoting the use of the newer lighting facilities, but, in addition, its personnel is engineering most of the projects in the territory. The league was the first organization of its kind to obtain one of the new street lighting evaluators, which is being widely used in Denver and elsewhere. The league now has on its staff two engineers from major manufacturing companies who are rendering almost nightly service in connection with the organization's survey of lighting conditions.

To further advance the standards of lighting and greater public appreciation of its value, the league is sponsoring the formation of a representative branch of the Illuminating Engineering Society. Under the direction of R. N. Hankins, chairman of the commercial and industrial lighting division, a new chapter will be formed in the Rocky Mountain territory during June. A full membership already is assured.

The league now has 16 local chapters, extending from Sheridan, Wyoming on the north to Deming, New Mexico on the south. Latest affiliates are the San Luis Valley Electrical League, covering four southwestern Colorado towns and the Black Hills Electrical League, taking in six South Dakota towns.

POWER For Defense

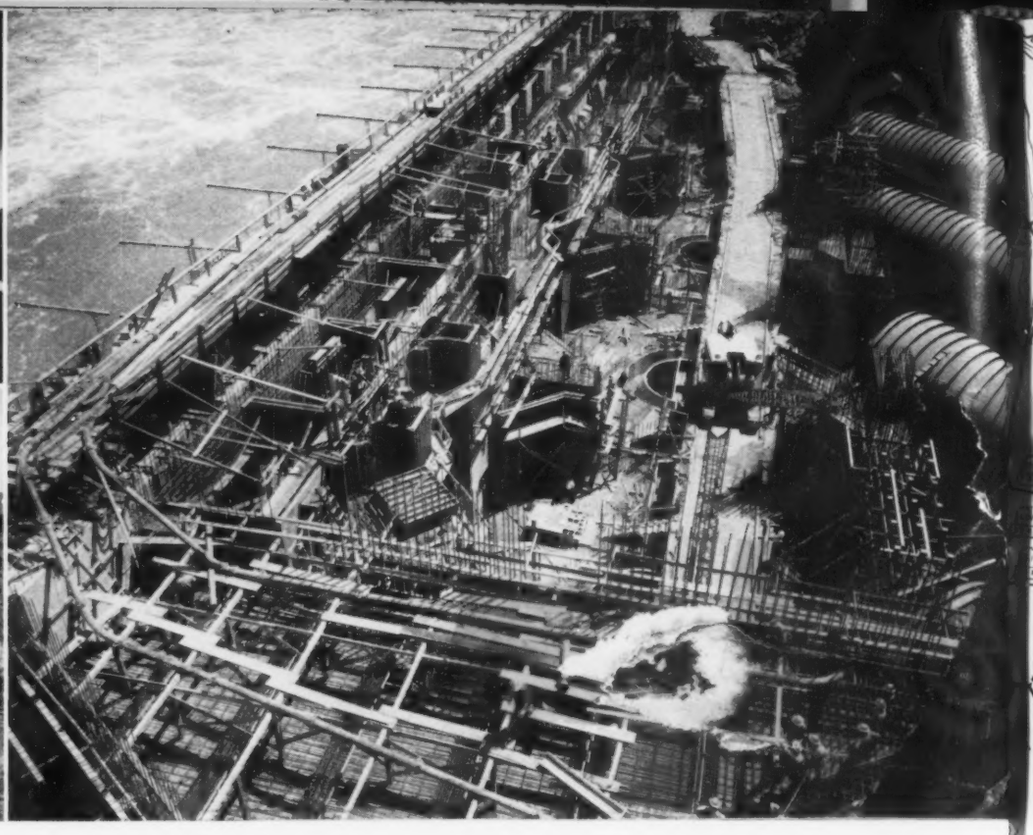


AS POWER demands go up, up, UP everywhere in the Far West, construction is being speeded on facilities to assure ample electrical energy supplies to meet normal and defense requirements. New generating capacity added will reach unprecedented peaks this year and next; transmission and distribution networks are being expanded, strengthened. On this and the following pages are examples of how the power industry is building for defense.

Originally scheduled for December completion, Southern California Edison's second 220-kv. Boulder Dam line will be ready in October. Production methods are employed. Here a 105-ft. boom traveling crane erects a bridge on a tower.

Supplementing the eight units already installed at Boulder Dam (Units N-1 to N-6 are shown below) three additional 82,500-kw. machines are being erected in the Arizona wing. A-1 will be ready for operation about September of this year, A-2 is scheduled for January and A-5 for August, 1942

POWER For Defense

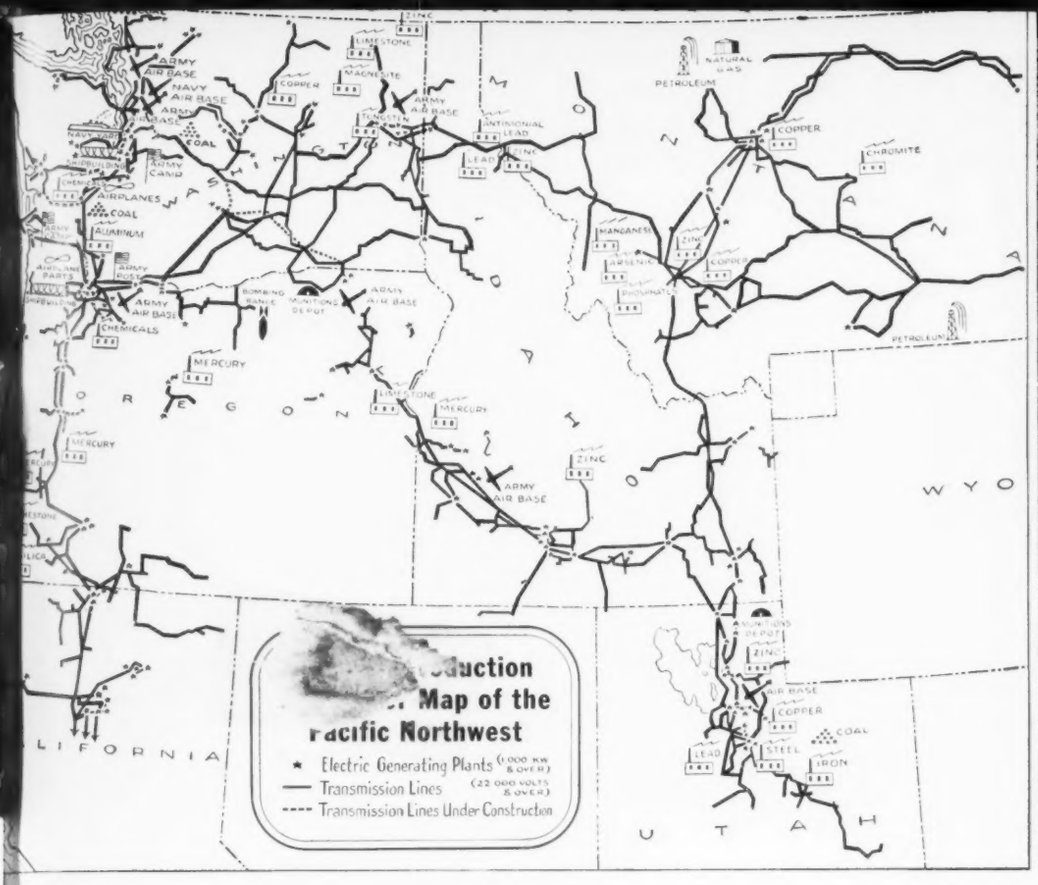


THROUGHOUT the Southwest an endless variety of jobs emphasize the relationship of power and national defense. In the Los Angeles Harbor district excavation has been started for the new 65,000-kw. steam plant (above left) of the Bureau of Power & Light. Located on a 15-acre site, the plant is to be ready by November, 1942. Mission substation, important link in the newest interconnection between San Diego Gas & Electric and Southern California Edison systems is shown below left. The 100-mile transmission line (bottom right) was rushed to completion last winter and power delivered even though a 50,000-kw. frequency changer will not be ready until June, 1941. Over on the Colorado River at Parker Dam penstock erection proceeds (above) as the power house substructure is poured. Initially three 30,000-kw. machines were to be installed, but a fourth unit has been ordered. The first power, to be delivered to Arizona, will be ready in December or January. As a link in the high tension loop around Los Angeles the Bureau of Power & Light is installing a 5-mile length of 138,000-volt, oil-filled underground cable (below).

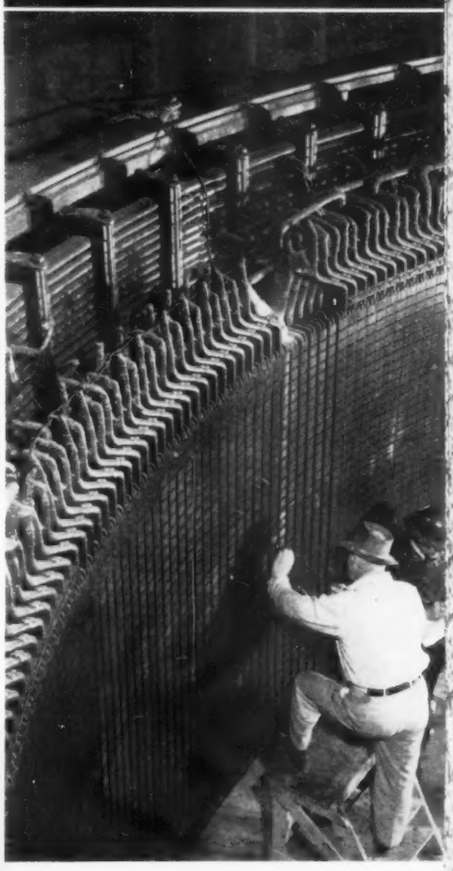
PRINT IN BINDING

POWER

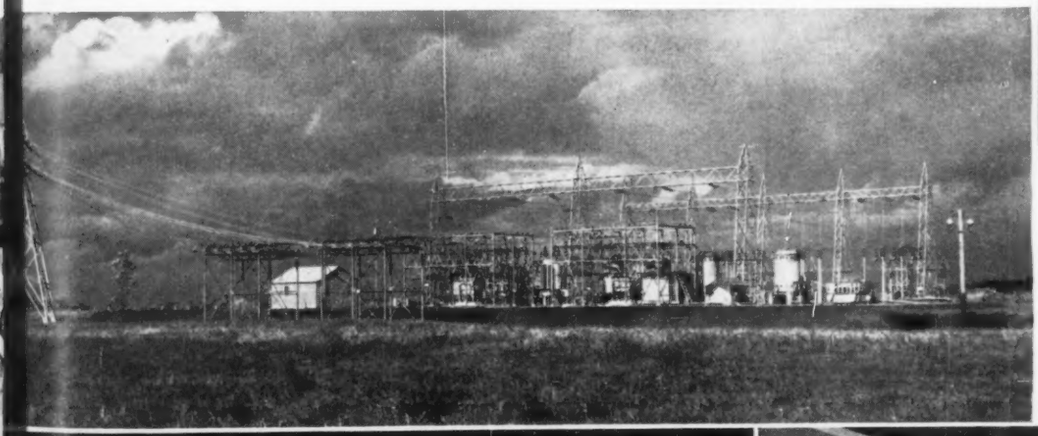
For Defens



Covering five times more area than the noted British grid the transmission system blanketing the Northwest is ready to deliver power to any defense undertaking. Largely the product of private entrprise, it ties together generating plants rated at 2,250,000 kw. with 400,000 kw. under construction. Below is the Bonneville substation delivering power to Alcoa; at the bottom the Bonneville-Coulee 230-kv. line



Largest waterwheel generators in the world are those at Grand Coulee, rated at 108,000 kw. each. Three are being installed. Work on the stator of Unit No. 1 is shown above, below is view of the rotor.



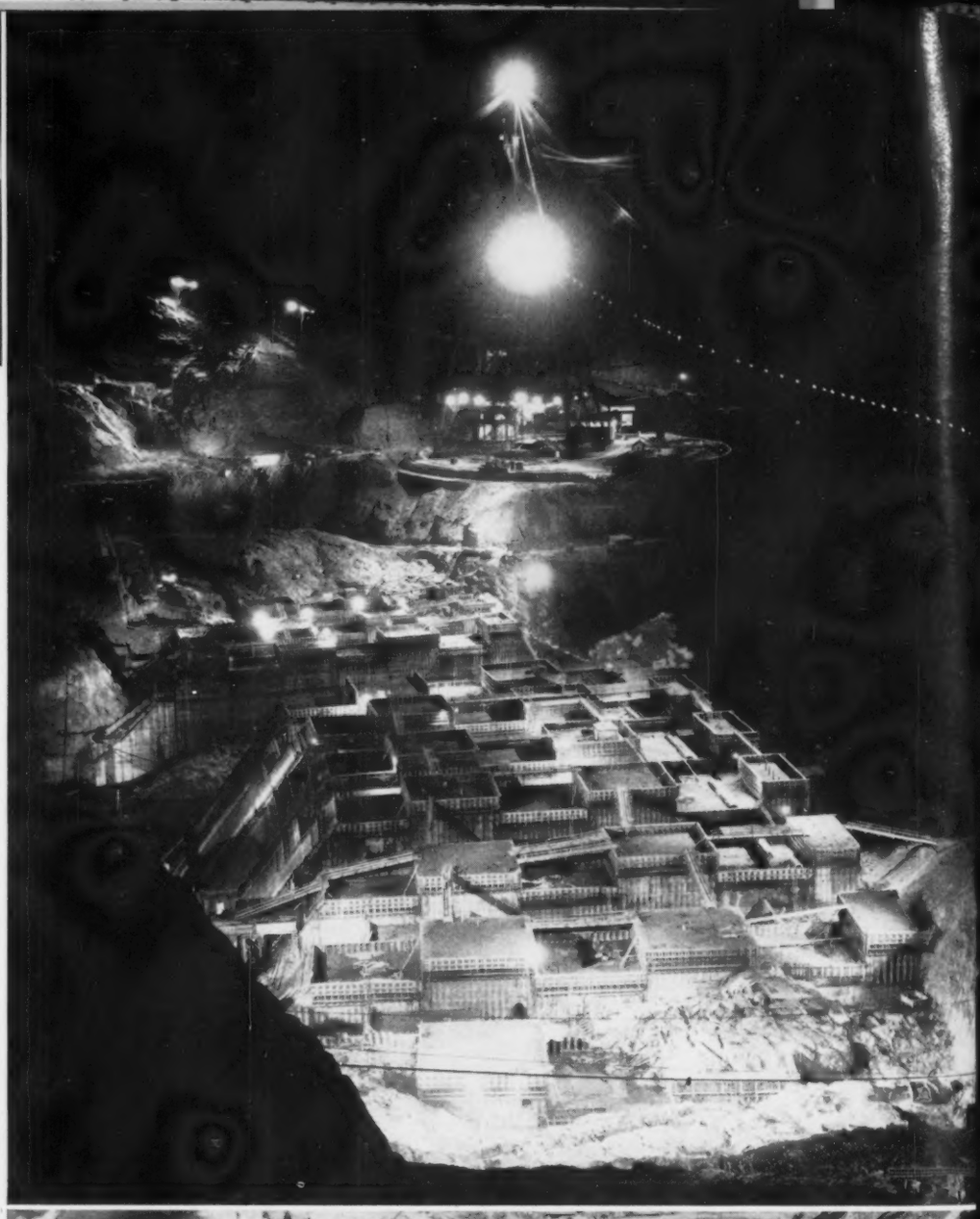
OWER

For Defense

Not until late 1944 or early 1945 will power be available from Shasta Dam, the USBR project on the upper Sacramento River. Concrete is being poured 24 hours a day under the lighting installation shown at the right. The dam will be the second largest concrete structure in the world, Coulee Dam only exceeding it in size.

Important adjuncts to the northern California power supply are the three steam-electric plants being built by Pacific Gas and Electric Co. adjacent to the oil refineries on the shores of San Francisco Bay. Shown (right below) is an air view of the Avon plant next to the Tidewater-Associated Refinery. The plants occupy a unique economic niche. They furnish an adequate and closely regulated electric supply plus large quantities of process steam to the refineries and in return burn sludge and other by-products under their boilers. The fuel arrangement and excess energy generated make the plants economical additions to the PG and E generating facilities.

Still another major addition to the energy supply in northern California will be the proposed Feather River plants of Pacific Gas and Electric, for which contracts have been let, although recently the FPC has raised the question as to whether licenses granted in February should be rescinded. Below is a view of the river near the site of the 68,000-kw Cresta plant. Pulga, rated at 80,000 kw. is further down the river



PRINT IN BINDING

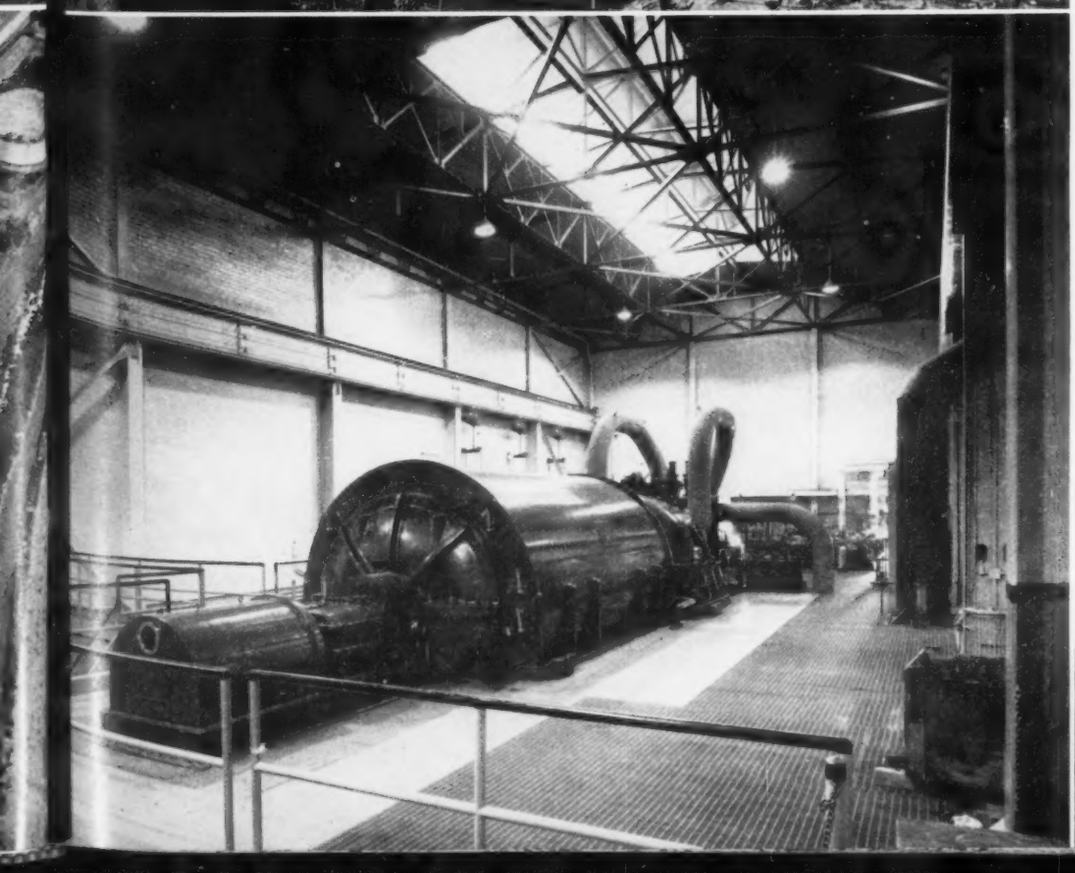
POWER

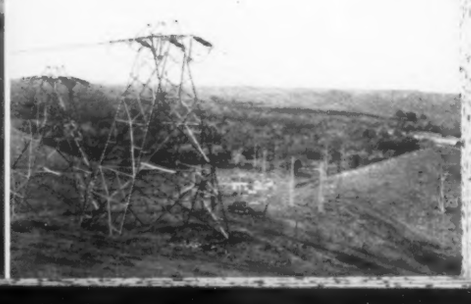
For Defens

Shasta Dam in daylight appears as in the picture to the left which was taken from the same point as the night view on the preceding page. The power house below the dam will contain five 75,000-kw. generators and two 2,500-kw. house units. In addition present plans call for a second plant at a regulating dam downstream at Kestwick with a total capacity of 75,000 kw.

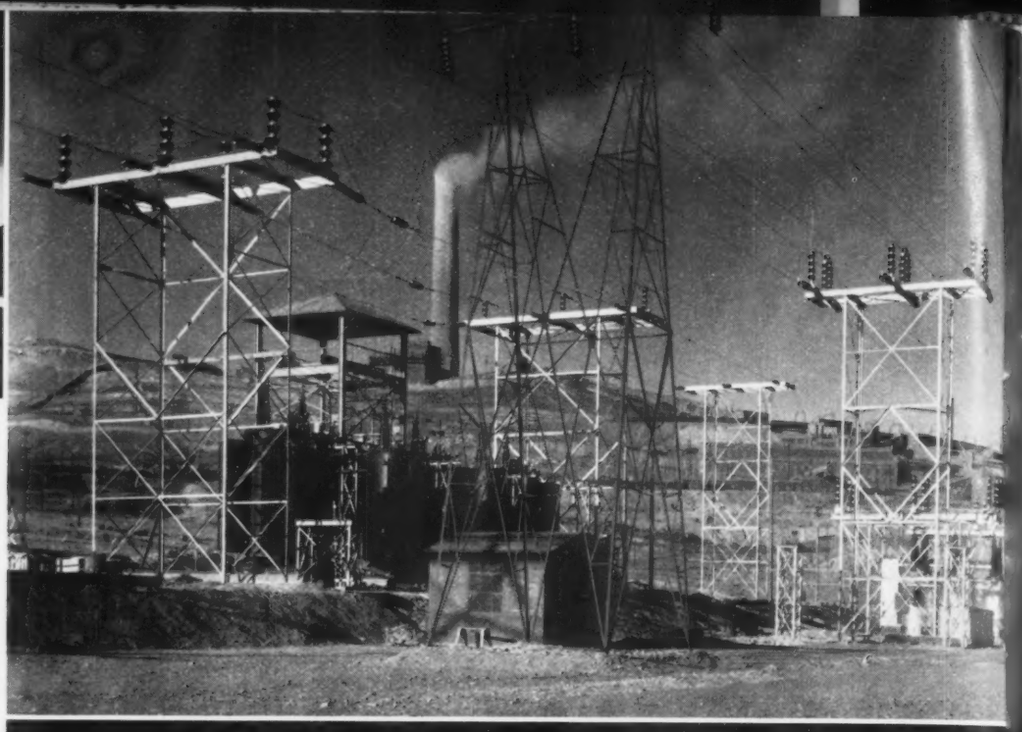
Avon and Martinez steam-electric plants will each house a single 44,000-kw. turbo-generator, while Oleum will house two similar machines. At the left below is a view of the Avon unit which has been operating since last December. The unit is a tandem-compound machine designed to operate at 950 deg. temperature and 1,500 lb. pressure. It consists essentially of a high-pressure non-condensing turbine coupled to a single-flow moderate initial pressure condensing unit. It is equipped with a combination of speed and automatic extraction governing because of the variable refinery steam supply.

Through a new interconnection between PG and E and Southern California Edison at Piedra in the lower San Joaquin Valley, the Edison 220-kv. Big Creek lines (below) are being tapped for 75,000 kw., raising to a total of 150,000 kw. the power available from Edison. This inter-connection is to be completed by January 1, 1942. Under the terms of the contract 110,000 kw. will be dropped January 1, 1945 to provide a market for Shasta Dam power

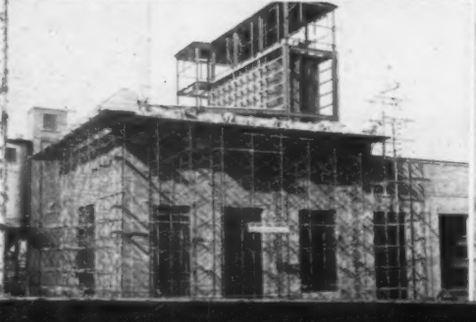




POWER For Defense



Ample supply of defense power for Utah was assured by the construction of a 277-mile, 165-kv. line from Grace, Idaho, to Anaconda, Montana. At right is the Montana Power Co. substation from which the line takes off with the Anaconda smelter stack, largest in the world, in the background. The line itself, of conventional H-frame construction, is shown at the bottom right. It delivers 35,000 kw. At right center is a view of construction work on the Colorado-Big Thompson project at Green Mountain dam near Kremmling, Colo. Here a 309-ft. high earth and rock-fill dam, second largest in the world, is being built. A 21,600-kw. power plant will be located below the dam. Three Utah Power & Light officials (below), H. H. Krueger, supt. of power, L. B. Fuller, chief engineer, and J. A. Hale, vice-president, check over the line of the Utah-Idaho-Montana interconnection. At the bottom is a view of the new Pueblo steam plant of the Southern Colorado Power Co., a 7,500-kw. plant with a 9,375-kw. overload capacity. It follows the one unit design — one boiler, one turbine and one generator with auxiliaries



PRINT IN BINDING

WHAT WAR DOES TO BUSINESS

By JAMES LIGHTBODY
Advertising Manager,
B. C. Electric Railway Co.

IN what way has the war affected merchandising and advertising? You might say that it is only beginning to have an effect. For the first seven months, remember, it appeared like a phoney war. We in Canada were working on a long range slow developing program and no one was particularly worried. It is true that many men went into the army, navy and air force but the war did not affect our lives in any drastic way.

One of the first actions by the government, however, was the control of foreign exchange. As a great many electrical appliances are imported from the United States this immediately affected prices and indeed we have never felt safe in quoting prices since. In addition to this, the supply of many appliances was somewhat doubtful and we would receive shipments of two or three or a dozen ranges at a time. We were fortunate to buy a large supply of refrigerators early in the 1940 season and there was no dearth of that appliance.

The refrigerator, as a matter of fact, enjoyed the best year in its history, not only in our sales department but among all the dealers in the territory. Lower prices were responsible in the main and more money in the pockets of the customer because of war activity was another factor.

In a similar way, house building activity in Vancouver and Victoria reached its greatest boom in 1940. Some 2,000 new homes were built in Vancouver alone, the average cost being about $2,600. Among those costing $2,500 or more about 60% installed electric ranges.

I mention this to show that the war first brought on a period of freer spending. The war scares of 1938 and the spring of 1939 were over and people at least knew where they were. While Vancouver has comparatively few large war industries, there was a quickening of tempo which showed itself more and more as time went on.

After the fall of France, Canada jumped into high gear and things really began to happen. At the beginning of the year the federal government as a makeshift method of meeting increased war expenditures boosted everyone's income tax 20%. In the early summer, it announced the basis of 1941 income taxes which multiplied the average man's tax three to four times. Many lower brackets began paying for the first time. Corporation taxes such as paid by the B.C. Electric were doubled to 30% of the net while we continued to pay 10% of the net to the provincial government.

In addition there was a national defense tax of 2% on everything, wages, dividends and so forth, deducted at the source. Single men getting $100 a month or more paid 3% on the whole salary.

An extra 10% duty on all imports was also imposed which affected many appliances made in the United States.

At the end of 1940 the government took another step to divert money into war channels which particularly affected power companies. It put a luxury tax of 25 per cent on all domestic electric appliances from the United States and an excise tax of the same amount on such appliances made in Canada, this tax being paid by the manufacturer or importer. Thus the price of these appliances has gone up roughly 25 per cent. At the same time the government imposed an absolute embargo on the importation of the majority of lines of electrical appliances from the United States.

These measures were announced at the beginning of December to go into effect the first of 1941, but the tax did not affect stocks in hand or in transit. Whether on this account or not, retail electrical business in December was of boom proportions. It was much the same in other lines. The money available to many families for the first time in years was being spent pronto. They had forgotten about the heavier income taxes soon to come along.

I should say that to the average visitor there is little or no sign of war activity in Vancouver. Business appears to go on as usual. There are some soldiers and airmen to be seen on the streets and boats in the harbor are painted gray. But closer inspection will show that the war is the only real business in which Canada is engaged. All our plants are guarded. So are all bridges and there are fortified areas from which the public is excluded. The front pages of newspapers are exclusively given up to the war. Practically all women are working on one or other phase of war activity. It may be on Red Cross, war comforts committees, war savings committees or the auxiliaries of the various regiments. Perhaps more than the men, they are right in the war. I mention this because most of our appeals to buy electrical appliances are made to the women.

Since the beginning of this year, the war has been coming home much more definitely to us, because of several things. First the government started a publicity campaign urging people to pay their income taxes in monthly instalments. This was to ease the shock which otherwise would occur on April 30, the date for filing tax returns in Canada.

Second, February was chosen for a drive to get everyone to sign up for regular war savings certificates.

This saving idea is now paramount in people's minds and suggests, I think, the tone which our advertising must take in the immediate future. It is being repeatedly urged by our government that our personal expenditures must be diverted from things of peace to things of war. They go so far as to say that our standard of living must be reduced. One slogan is that we

"A public utility company has a chance to express its patriotism in various ways and still keep away from commercialism. We aid all charities and drives—no strings."

can't fight a "Made in Germany" war on a standard of living made in the United States, a reference which I submit is quite complimentary to you.

Now, you can't hear any discussion like this among any salesmen. There are probably just as many outside salesmen at work as ever and department stores have their special sales in exactly the same way as before the war, but the heads of the big manufacturing and jobbing companies know that their plants are being diverted from making articles of peace to making munitions of war, and some of these articles will be harder to get as time goes on.

My own opinion is that our advertising must take cognizance of the war atmosphere prevailing at the moment. Right now, with the government stressing the need for saving, it would be fatal for us to show too much luxury or to attempt to offset the government's efforts in any way. To be even more pointed. we cannot even attempt to nullify the luxury tax placed on electric appliances. I am sure such advertising would meet with public resentment.

There appears to be no objection to straight staple article advertising. To advertise a range or a water heater or a refrigerator at a price would arouse no question but too much persuasion might do so.

If we must make out a case for electric cooking, refrigeration or water heating, I feel that it must be hitched to our national situation, not, of course, capitalizing on patriotism but perhaps suggesting the economy in time or money of such ownership. There are dozens of war-time angles that can be used in advertising. The growing scarcity of domestic help, the time women are devoting to voluntary war work, the patriotism of using local water power and so on are all safe appeals and in addition have the advantage of timeliness. It is hardly necessary to mention this because all good advertising men have their ears to the ground and time their appeals according to the prevailing sentiment. It is not only a question of what to avoid doing but how to use one's opportunities to do something which will catch the public's imagination by being in advance of every other advertiser.

Here some fine work has been done by individual advertisers along the line of patriotic posters. One or two use nothing but the name of their product, such as bread, and a stirring picture, say of the British navy or the RAF. Others have missed the boat by trying to link patriotism too much with their product, which the public resents.

A public utility company has a chance to express its patriotism in various ways and still keep away from commercialism. We aid all the war charities and drives by means of our advertising and there are never any strings attached to it. We could not do otherwise. Even to stay silent would soon direct unfavorable attention to us in a country devoted solely to the business of war.

We are not, of course, nearly in the position of Britain where advertising has been shot to pieces. From the advertising publications from over there I understand that there has been a great reduction in private advertising and a great increase in government space. And here is the unusual development: Firms who wish to keep their commodites sold are advertising to use less of them. Translated to our business, we would advertise electric cooking in terms of how to reduce your electric cooking bills! I think that might be a good idea for us, because it would be so unusual. I also understand that sex appeal in Britain has gone entirely masculine.

In Eastern Canada, daylight saving has been extended throughout the winter by our federal government as a means of conserving power. It may be imposed on the west also although we have not had such an enormous increase in power load as back east. We have no power shortage in sight and have facilities to increase our capacity in plenty of time. In spite of that, the eastern situation has already caused the newspapers to raise the question of our power capacity. We have had to give assurances that there is not the slightest danger of a power shortage. If this feeling were allowed to grow, it might affect our electric cooking load.

We have not curtailed our advertising to any extent. We carry on Better Light-Better Sight advertising and maintain our staff of home lighting advisers as usual. We are also actively promoting better commercial lighting, including fluorescent. Our dealer program is probably more active than ever as they are becoming better organized to sell radios, washing machines and other appliances we don't handle. There may possibly be a slight decrease in our merchandise advertising this year as stocks are harder to get and in general we scrutinize expenditures more closely. Copy is going more institutional as specific selling becomes more difficult.

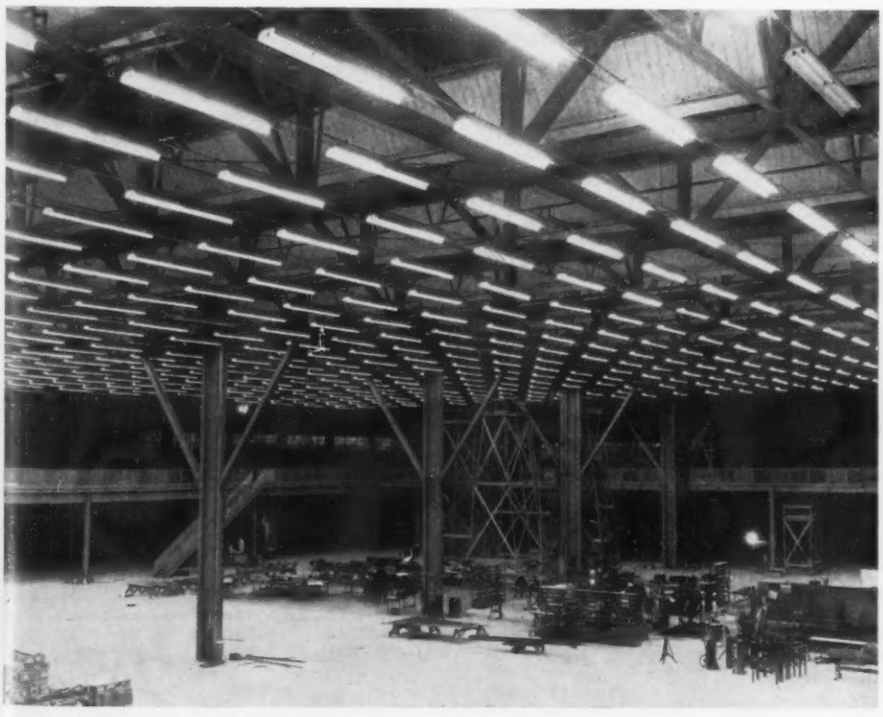
"Firms who wish to keep their commodities sold are advertising to use less of them. Translated to our business—advertising electric cooking on how to reduce bills."

Sound-proofed, air conditioned drafting room gets 45 ft.-candles from 48-in. fluorescents in Lights Inc. fixtures over individual and this giant drafting board. Note traveling template camera

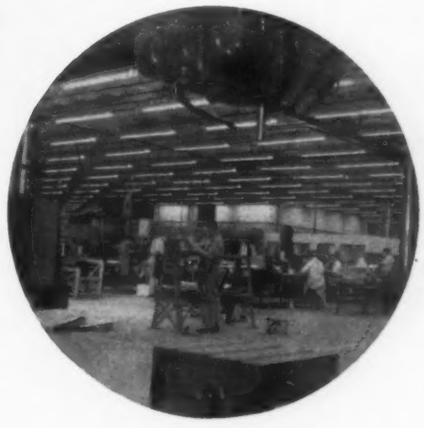
TWENTY-EIGHT MILES OF LIGHT AT VEGA

★

Part of 600 x 850 ft. assembly room which is lighted by 17,880 Westinghouse Mazda F lamps in 4,470 units, 42 ft. above floor; rows 8½ ft. apart, fixtures 17½ in. apart—45 ft.-candles.



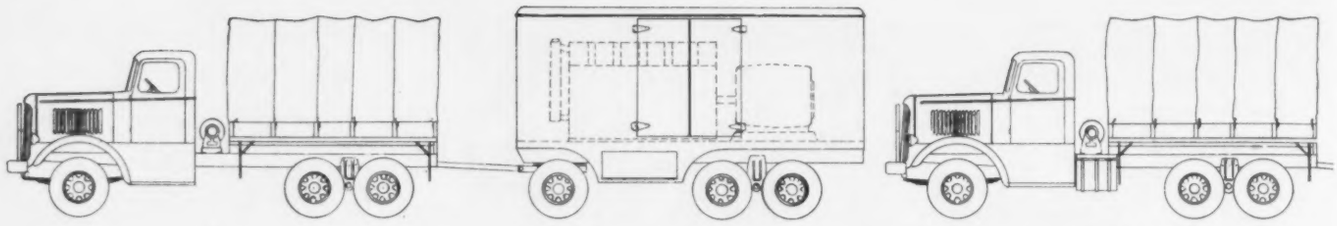
AREA of the new Vega Airplane Co. plant at Lockheed Air Terminal, in Burbank, is equivalent to 14 football fields with end zones. Lighting for this entire area, from office and drafting rooms to assembly plant, shops and parts storage department is entirely with fluorescent lamps, 36,524 40-watt, 48-in., 3,500° K white, or 27¾ miles of tube, a total with auxiliaries of 1,679 kw. in lighting. The main manufacturing plant measures 600 x 850 ft. with a J-shaped mezzanine around three sides, making an area total of 510.000 sq. ft. ground floor, 197,000 mezzanine. Mounting heights are the highest yet attempted with fluorescent, ranging from 35 to 42 ft. yet an average intensity of 45 ft. candles is maintained at 3 ft. from floor level.



Toolmakers shop with same kind of lighting. Units are separately plugged to adjacent outlets for individual servicing or change.

All lighting circuits are balanced so far as possible on a 3-phase, 4-wire, 120/208-volt system fed from eight distribution stations equipped with from four to eight transformers. The electrical and lighting design was planned, for offices by John Parking and Donald Parkinson, architects; for the plant, H. J. Thompson, plant engineer, Paul McCully, Paul F. Larson and L. H. Wiltse, electrical engineers, J. B. Ferguson and Jack Tielrooy, electrical draftsmen. Outside protective lighting was planned by Chief Paul Scott, plant protection department. Electrical contractors were Jones Electric Co. and Commercial Electric Co.

The $7,000,000 Vega factory employs 5,200 workers at the present time, and when this world's largest fluorescent-lighted plant swings into full production, will require an estimated 15,000 to 20,000 personnel.



1 2 3

A MOBILE EMERGENCY POWER UNIT

By G. L. WILDER
Chairman, Reserve Military Mobile Power Organization

A GROUP of men in southern California has developed a plan which it believes should be inaugurated in connection with national defense preparation. It concerns the supplying of power to remote areas or to vital points where the normal supply might be interrupted at critical times. The group referred to consists of executives, engineers, production and purchasing agents and mechanics. This group has worked out the details of a plan whereby the power needs of an Army encampment, a flying field or air base, a vital pumping plant, an important industry or Army repair shops might be quickly provided in the event of lack of power or failure of the normal power sources. This would be accomplished by means of local emergency mobile power units of suitable size, manned by trained personnel, and cooperating with any organization needing emergency power quickly and in relatively small quantities. The proposal has been declared sound by many who are in a position to know the needs of a country making every effort for national defense.

The proposal includes the formation of a mobile power regiment, to be organized and operated as a branch of the United States Army or National Guard, and to be coordinated with other organizations to render efficient aid in emergencies. It would in no way interfere with existing power supplies, or conflict in any way with established utilities. It would be noncombatant, and would operate in rear areas. The personnel would be comprised of men between the ages of 45 and 65, although younger men could be included if necessary.

A mobile power regiment would consist of three battalions, strategically located, and fully equipped to serve an entire area. It could supply temporary landing fields, new Army posts, emergency camps, warehouses, dumps, railroad yards and docks with power for ventilation, fuel, water, sanitary requirements and other uses. It could follow advancing troops, in rear areas and service occupied communities of strategic value.

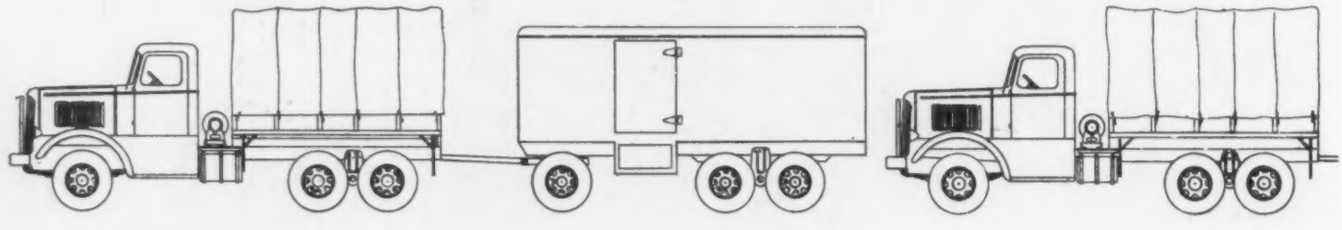
Each mobile power battalion would consist of a headquarters company and three or more field companies. A field company, suitable for southern California, would consist of two gasoline engine-driven generating sets with accompanying tow trucks. In addition there would be one fuel truck and trailer, one water truck, one each quartermaster and commissary trucks, one repair shop trailer, one medical unit trailer, two light personnel trucks and two sidecar-motorcycles.

The a.c. generator units proposed would be 375 kva. each, with direct-connected exciter, and with a flexible coupling to a super-charged 1,200-r.p.m. gasoline engine. The weight of the generating equipment would be approximately ten tons, and generators would be of standard construction to facilitate repairs or exchange of parts. The generator voltage would probably be 2,300/4,000-Y volts, 3 phase, 60 cycles with suitable switchboard equipment. Transformers, carried on the tow trucks, would be provided as a part of the equipment to provide for a wide range of voltages above or below the nominal generator voltage.

The generator units would be mounted on trailers, drawn by trucks, and would be shielded from the weather by movable sides, top and ends. Trailers would be pulled by heavy-duty standard haulage trucks, to conform as closely as possible to standard heavy-duty Army trucks of 10-ton capacity. The trucks would be electric lighted throughout, and equipped with two-way radio communication. Portable floodlights operated from a battery would assist in parking and locating the generator units at night.

It is proposed that the repair shop trailer be a 10-wheel trailer with an approximate weight of 10 tons. It would be hauled by any company truck, and would be equipped with both electrical and shop equipment. The electrical equipment would consist of a 25-kva., 230-115 volt, 3-phase, 60-cycle generator driven by a 35-hp. gasoline engine, to supply power for shop tools, flood lights and other external lighting. The shop equipment would include lathes, drill press, electric and gas welding outfits, arbor press, forge, electric drill, machinist's hand tools and other equipment and supplies needed in salvaging and repair work. In addition, two-way radio would be carried, as on all trucks of the companies.

The repair shop unit was provided



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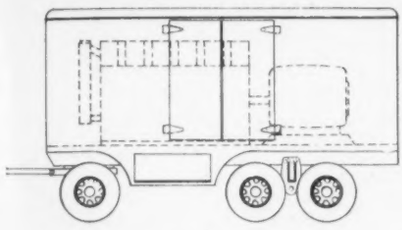

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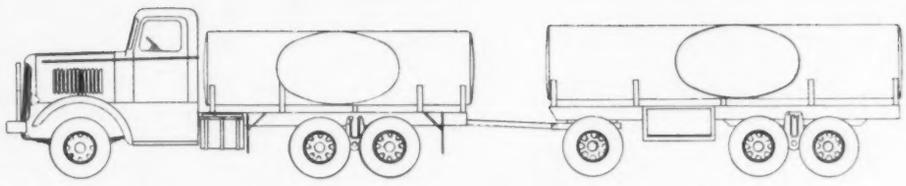

5 6

principally so that the mobile power unit might function independently, and its needs never conflict or be coincident with those of combat or engineer general units. It should be pointed out that although the functions of this unit may seem to be duplicated by the Army's salvage, shop and motor transport repair units, it appears highly desirable to provide the mobile power unit with all the facilities to render it a self-sufficient unit, and enlarge its scope. Once the units have been dispatched to an area where they are to function in temporarily powering extensive shops, refrigeration plants or large cantonments, or in suppyling light, power or energy for pumping water or rehabilitating existing facilities, they should be capable of performing the task without assistance of the other Army units which may be needed in an entirely different locality.

Fuel and water trucks and trailers have been suggested, each to be electrically lighted and equipped with portable floodlights and two-way radio communication. Also a commissary truck pulling a rolling kitchen, would provide for the daily needs of the 68 men comprising each company.

The headquarters company, in addition to handling the administration duties, would include a procurement section to conform with Army methods in the procurement of supplies. A signal or communications officer, an intelligence officer, a supply officer, and one mechanical and electrical officer with drivers, orderlies, and messengers would be attached to this company to administer and operate all branches of the battalion.

Such a mobile power unit would be self-contained and capable of operating for considerable periods of time within a proposed radius of 200 miles from its basing point. It is argued that not only would these units be capable of supplying power, but they would be able to render emergency repairs to industrial substations, reconditioning distribution lines in remote areas, and take power from or deliver power to existing power lines, which had become isolated. Water deliveries in small quantities could tide over shortages, and fuel and water mains could be welded for temporary repairs. The smaller utilities might conceivably be cut off for appreciable periods of time, rendering their vital services inoperative. An excellent example of this happening is the recent power outage in the Panhandle of Texas, where extreme ice loading broke lines over a wide area, and where a mobile power unit from a utility in Kansas was called into service to pump water for a town in the center of the stricken area, while line crews from utilities in three surrounding states took two weeks to provide normal electric service in the area.

One of the chief reasons why it is believed that the mobile power unit should be an Army function is that only the Army can properly dispatch such units to locations where the need is greatest. Even if the utilities were physically or financially able to provide such units as proposed (it is the opinion of leading power executives that they are not) the utilities would not be in a position to dispatch such units properly to their several customers who might stand in greater or less need of them.

With the Army, no question of policy arises, and applications could be concentrated where needed. When it is further recalled that no one utility can work over the territory likely to be covered by the Army's theater of operations, the need for sponsorship of the mobile power units by the Army is believed made further apparent.

It is the opinion of several utility men in the Los Angeles area that the mobile power units would have their chief function in replacing the power source in the smaller towns which might lie in the Army's theater of operations. Examples of this might be found in the towns of Barstow and San Bernardino, in California which lie between Los Angeles and the Mexican border, and are important transcontinental rail and highway centers with repair and maintenance facilities. Again with particular reference to southern California, the importance of water supply in the territory contiguous to Los Angeles cannot be overestimated. This water supply is dependent on the supply of electrical power. There are hundreds of pumping plants in this area requiring an average of 350 to 500 kva.

Interesting side lights on the Army's interest in the use of ships equipped with special generating units for supplying power for emergency shore service have been published in recent months. The originators of the plan for reserve military power units believe that their proposal richly deserves application as an Army function.

Mobile Power Unit Train

Vehicles and equipment comprising a proposed mobile power unit train (shown across top and bottom of these pages) include (1) and (3) two trucks for generator trailers (3) and (4); fuel truck and trailer (5) and (6); commissary truck (7); hauling repair shop trailer (8); quartermaster truck (9); hauling medical trailer (10), and two personnel cars (12).

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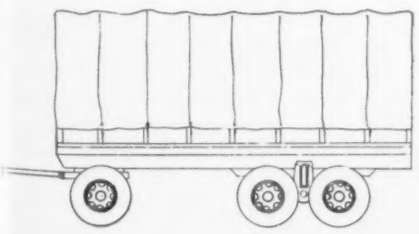
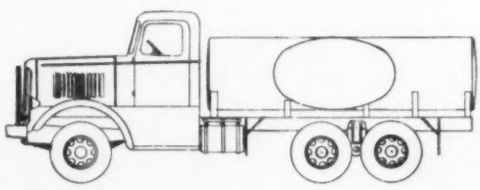
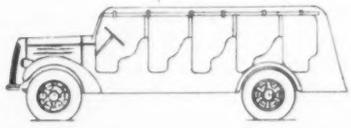






WHAT THEY SAY ABOUT WIRING

IN THE P.C.E.A. ESSAY CONTEST WINNING PAPERS

MOST of what is said about wiring isn't fit to print. That's bcause most of what is said deplores a *lack* of it. Since everyone has cussed and discussed inadequate wiring, the Pacific Coast Electrical Association decided to attack it from the positive side. In doing so it called upon its entire membership to say what they thought beneficial about *adequate* wiring.

An essay contest on the subject, "Why I should rent, buy or build *only* an adequately wired home," was conducted as a memorial to Richard E. Smith, late employee information committee chairman, offering as a prize an expense paid trip to the Coronado convention. In this contest 375 members of PCEA entered essays of not to exceed 750 words. From this number nine were finally selected as winners after a thorough reading of the papers.

These nine were: Miss Hazel M. Stirneman, commercial office, Southern California Edison Co., Redlands; Miss Mary Shoop, advertising dept., Edison Co., Los Angeles; W. T. German, industrial sales dept., Edison Co., Whittier; W. E. Moody, commercial office, Edison Co., Redlands; Jack W. Martin, sales dept., Pacific Gas and Electric Co., Stockton; Miss MaBelle Smith, electric dept., P. G. and E., San Jose; T. E. Cooke, credit agent, Edison Co., Pomona; H. J. Moore, sales dept., P. G. and E., Sacramento; and E. E. Cassidy, Edison Co., Ventura.

Extracted from these essays are effective reasons for adequate wiring, reasons which everyone else in the electrical industry can tell in their own words to friends, acquaintances, customers. Following the publication of these excerpts from the prize winners, ELECTRICAL WEST each month will endeavor to extract also the ideas and expressions of other contestants so that the fullest spread of these beneficial statements about wiring may be given throughout the industry and from it to the public.

A Woman's View

Hazel Stirneman says: . . . A woman considers any wiring problem from the standpoint of her own convenience and ultimate satisfaction rather than from the angle of increased property value. I would like to give a woman's reasons why a home, rented or owned, should be adequately wired.

First: Safety

Insufficient outlets bring the temptation of trailing cords, always a hazard. Overloaded circuits induce the exasperated householder to put in heavier fuses, thereby throwing the load back on the too-light wiring, an extremely unwise procedure. Your light fuses are your safety valves; when they refuse to carry the load of the average household and your equipment is in good condition, look into the wiring of your home. Perhaps you are expecting 1941 efficiency from house wiring thirty years old.

Second: Convenience and Comfort

Today's homemaker is a modern, efficient woman. She prides herself on a smoothly run household and takes her rightful place in civic and community affairs. How much more leisure she can enjoy, with all the splendid electrical equipment at her command, than her mother or grandmother did. Yet in many homes, houses not so many years old, must the busy housekeeper disconnect the floor lamp to connect the vacuum cleaner or, worse still, move the chesterfield to get at the only available outlet. (What fiendish impulse prompted so many electric contractors to place the only wall outlet in a room in the middle of the only large wall space, which must be used for a bulky piece of furniture? I speak now in the voice of a disillusioned renter.)

How much more often she would use her electric mixer if it had a permanent place near a convenience outlet. Her pride and joy, the electric roaster, is perfect for complete meals. But is her kitchen wiring heavy enough to carry it if she decides to do the weekly ironing with her 1,000-watt iron while the roaster is operating? Many times not. She must make the breakfast coffee first, then the toast or waffles, because there is only one outlet in her dinette. How many service porches in houses over six or seven years old have any outlet within reaching distance of the place the washing machine must stand? Inadequately wired homes.

Carrying out fresh ideas and originality in room arrangement is dear to every homemaker's heart. But when the radio must stay in the same old corner to be near the outlet and you dare not move father's chair because the lamp cord won't reach, when the beds can't be moved to catch the breeze in the summer and out of drafts in the winter unless someone gives up reading in bed, then some of the joy of homemaking is lost and it becomes a monotonous task. I have heard so many women remark, looking longingly at some piece of intriguing new electrical equipment, "Oh, I'd like so much to have that if I only had an outlet in the right place to use it." Inadequately wired homes by the thousand.

The Human Side

Miss Mary Shoop: . . . This home is the culmination of a lifetime of dreams. Our main thought was to build it for real living, to make it comfortable and adapted to our way of life.

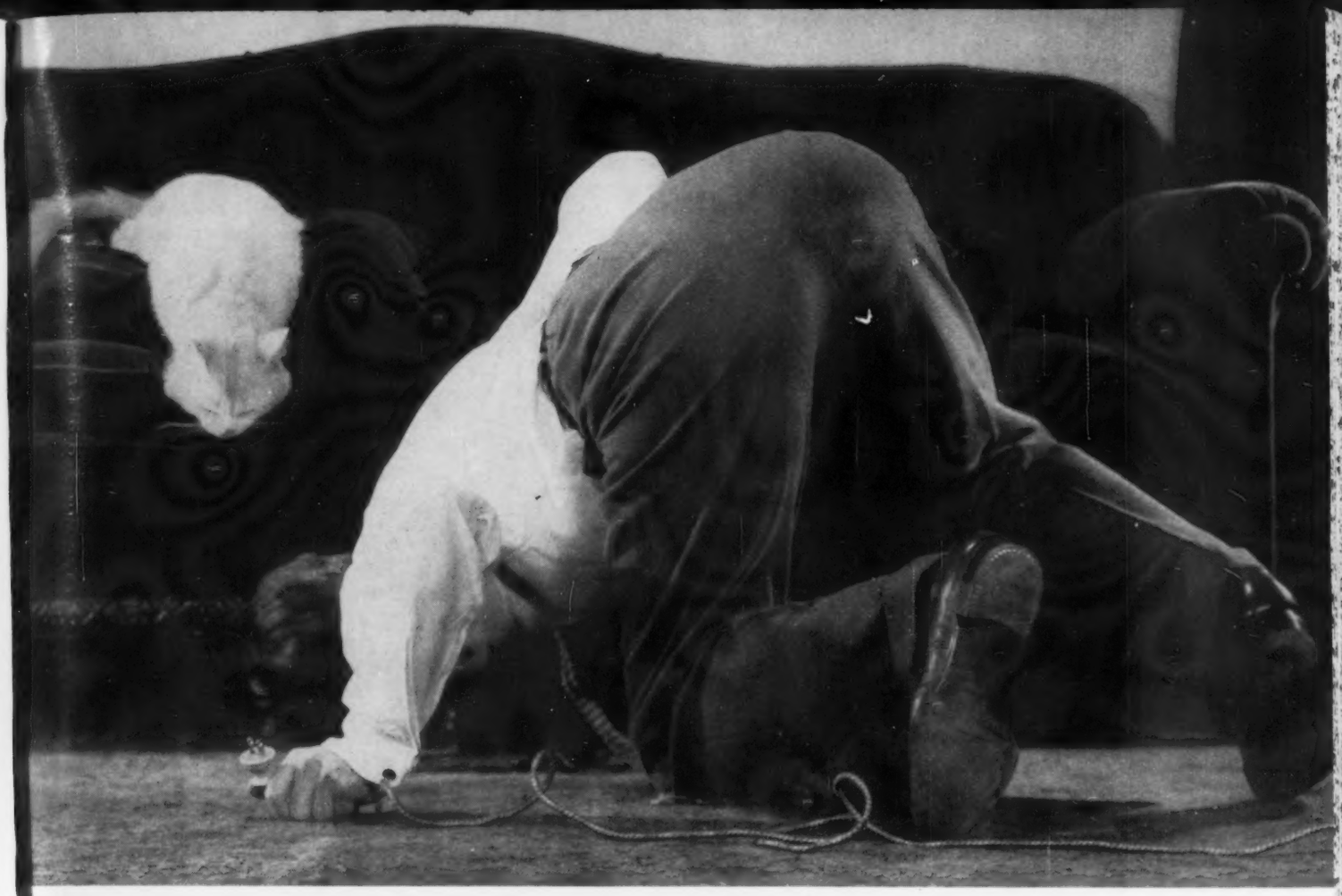
Adequate wiring gives us lots of electrical convenience outlets. In the living room that means every chair has a good reading light because I can place lamps anywhere. I can move furniture around if I like . . . and that is a pleasure after our former house whose single outlet in the living room froze the furniture right where it stood.

It is grand to be able to connect the living room radio and electric clock without multiple outlet devices and extension cords. And I can connect the vacuum cleaner in the part of the room I am using it. I shall never forget the time I broke an expensive vase because the long pulling cord of the cleaner, attached to the room's one outlet, upset an end table.

Ever since my mother broke her arm by a fall in a dark room, we have been aware of the need for lots of light switches. We have three-way ones at the main doors of every room, and do no owlish groping in the dark.

To us, adequate wiring is not a prosaic subject concerned only with wire and switches. It is a colorful backdrop for the drama of daily living, an essential element in comfort, something that affects our dispositions and actions.

It seems to me that the electrical people could improve their promotion of adequate wiring by humanizing it more. They frequently talk only of size of wire, service entrance units and number of circuits. In my opinion, what they should emphasize above all else is adequate wiring's human side



. . . its importance in personal life, the welcome comforts it provides, its role in family harmony. If everyone fully realized these values, every home that is built would be adequately wired.

Home Safety

W. T. German had this to say in favor of adequacy:

Adequate wiring is truly economical; the meter, the entrance switch, and service wires will be large enough to supply electricity for any equipment that may be added in the future. A work shop, a barbecue pit, a badminton court may be added without costly changes in the initial wiring.

Insurance organizations remind us continually that the home is the most dangerous place to the average citizen of our nation. Adequate wiring as a means of safety can not be overestimated. It eliminates the hazard of fire due to overloaded electrical circuits. By providing sufficient outlets we reduce the danger from tripping over cords connected to equipment considerable distance from the outlets. Likewise, we eliminate frayed cords caused by frequent walking on rugs under which are hidden cords that cross the room to a radio, lamp, or other device.

Kitchen accidents are minimized by providing adequate illumination in the working areas with no glare in the eyes of the worker. Adequate illumination will play as important a part in reducing accidents in the home as it has in industry, where in the last decade accidents have declined over 50%.

The bathroom heater with its instant heat adds to both comfort and health. Heating pads, air conditioners, medical vaporizers, therapeutical lamps, and refrigerators are all becoming increasingly important for healthful living, and adequate wiring contributes materially to the ease of their use.

Adequate wiring for beauty, comfort, convenience, economy, safety, and health; here are six reasons for occupying an adequately wired home. The seventh and most important reason is the fact that adequate wiring provides one with an opportunity to receive all the advantages and benefits that the members of the great American electrical industry are continually passing on to the people.

Woman Has a Job

W. E. Moody: . . . My first consideration would be for the safety of my family. Improper wiring is a constant source of danger. . . .

Any woman who runs a household has a big job on her hands. I believe it is up to me to do what I can to make that job easier in my own home. In an adequately wired home a woman's tasks are made much lighter. Without adequate wiring in her home she is like the artisan who, for lack of tools, becomes a laborer.

Electricity is the most modern and most efficient source of power available today. Without adequate wiring in her home the housewife cannot take advantage of the power that is waiting to serve her so ably.

It is hard to find a single household task my wife performs in which electricity cannot come to her aid.

I cannot afford servants to perform the labor and drudgery that is a part of all housework, but I can afford to hire electricity which conquers the most unpleasant tasks swiftly and efficiently. The home should be the center of a woman's life. It can never be that if its associations are unpleasant. No woman can enjoy her home if it is merely the scene of heart-breaking labor for her. . . .

Then I would be sure the house I bought was adequately wired for purely selfish reasons. By adequate wiring the value of my house is increased. It is easier to rent. It is more easily sold.

My house will be adequately wired for reasons of economy. I believe that because of its efficiency electricity is the most economical source of power and heat and light obtainable. The only way I can take advantage of this great aid which is there ready to serve me is by buying an adequately wired home.

Investment Angle

Jack Martin, of Stockton, said it this way:

If you buy or build a home you are making a considerable investment. Adequate wiring helps to protect this investment by postponing serious depreciation. You will find that the home is of more value to you at all times. Should you, after a number of years, wish to sell or rent your home you will realize a greater return than if the wiring is inadequate. Again, if you should buy your home on a long term loan it would be somewhat embarrassing to find it obsolete before your loan was paid up. There is no cheaper insurance against such depreciation and obsolescence than adequate wiring.

Your wiring system, although the nerve center of the home, is the least costly of the major items of construction, averaging around 2½% of the total. The additional cost of adequately wiring the home is very little indeed. Assuming you financed the home over a twenty-year period, your cost would only be about one to three dollars more per year than an ordinary installation, yet at the end of that time the wiring system will still be up to date and able to carry any additional load.

Most people do not think of their house wiring having an effect on the efficiency and cost of electricity. However, inadequate wiring brings about a low voltage condition and as a result your lights do not burn brightly, and your appliances are much slower in performing their work, although just as much electricity goes through the meter as if the efficiency was 100%. Tests have been made showing a decrease in efficiency of as much as 30% and an increase in cost of operation of 20% due entirely to improper wire sizes. Even though electricity is your cheapest household commodity it need not be wasted; there is no better way of insuring yourself against such waste than to insist on adequate wiring.

The trend of electric rates has been downward for many years and will continue to decline. Along with these reductions it is certain that more electric appliances will be used, and you will need the reserve capacity that adequate wiring provides.

Keep the Family Home

Ma Belle Smith: We had the advice of experts in planning the wiring of our new home, and *have* we got charm, comfort, convenience, economy, and safety!

No more tripping over cords, which are run over rugs or under the furniture, which interfere with vacuuming and cleaning, and gather so much dust. Now, I can change my furniture about in the rooms to my heart's content, for every room has convenient and sufficient outlets for proper and attractive lighting, radio, clocks, and other appliances.

SECURITY

By H. J. Moore

The number on the front door of every adequately wired home is the social security number for the family that dwells within.

For adequate wiring means just that — security. Security against fire dangers which menace the inadequately wired home. Security against bad lighting and all the ills attendant upon eye strain. Security against drudgery on the part of the mother of the family and often of other members, too. For adequate wiring invites the use of more electric equipment and means that ALL the routine chores of daily family life can be speeded up and lightened. Security against inroads into the budget, since better wiring and better equipment cut operating costs to a minimum.

And on the spiritual side adequate wiring means security against black-outs. In a troubled world that means a spiritual lift, insuring us here in America against the loss of those things which are already gone in so many countries.

Adequate home wiring is, in a sense, a symbol of all the things we hold so dear. And every American owes it to himself, whether he rents, buys or builds, to demand and receive the security and symbol of free men.

I don't know much about "correct voltage" but do know that all of my appliances are working more safely and satisfactorily. The fuses don't blow and I don't have those embarrassing interruptions and delays, just when I need my electric service. I don't have to stop my housework to call in the electrician any more . . . with the money I used to pay him, John says I can buy more stockings.

John has become such a stay-at-home since we have proper lighting, that I can hardly get him out in the evenings. When we do go out and return home he always has *too much* to say about the lighting (or rather lack of it) in the homes of my friends.

Connected to our garage, we have a combination play-room and work-shop, wired for a saw, train, radio and other electrical gadgets, where John and the children love to spend hours, playing and experimenting. Honestly, Jane, I do believe my young son will grow up to be electrician, repairman or inventor. I hope it is the latter, because if all the houses were wired like ours people would need fewer repairmen, but more inventors.

Wiring dates the house . . . our house is so wired that it will be modern and up-to-date forty or fifty years hence. This means that should we wish to sell, we could get a fancy price for our house. If we chose to lease, the house would command a high rent and we could choose our tenants.

We are not prophets but we have wired our house so as to be ready for the wonderful inventions which I am sure the future has in store.

Five People—Six Radios

T. E. Cooke recites the figures to prove his declarations:

My far-seeing contractor decided that 6 outlets and 990 watts of light would be ample for all future needs so six and 990 there were—and no more. Today there are 33 not counting the range and heater plugs and 4,950 watts of light. When more are needed they'll be installed. The number of 10 service wire is now number 2 and an overloaded circuit is just something that happens to someone else.

You will have to admit, however, that I'm entitled to a slight feeling of complacency when I survey the coils of extension cords hanging, dusty and no longer needed, in the garage. There's more than satisfaction in the knowledge that radios, roasters, fans and fryers, toasters and mixers are all truly portable and by gosh if we want silex coffee and waffles in the back bedroom or the garage there are adequate facilities in both places to handle the situation.

A landlord or realtor would never be happy with me in his house. Five in the family and six radios! I'd drive him crazy, but the wiring contractors would, for a while at least, enjoy the horn of plenty.

And so should you also do likewise. Turn that analytical eye of yours on your own household sometime. See how seldom the little woman uses some of those lovely electrical gifts you gave her simply because it's more trouble to stumble over the cords and hunt for outlets than it is to do without. You'll be amazed at the number of *electaps* that you *simply haven't got.*

Our Self-Interest

E. E. Cassidy talks of the self-interest each one has in the subject:

I have selected the electric utility business as my profession. Because I am selfish, I would like to see my future secured by helping to secure the future of that business. I can help accomplish this by living in an adequately wired home. You ask "How?" It's simple. Picture myself as the hero in the first chapter. I've built a new home and you can bet your life that I'm going to talk about it, and plenty. I'll talk about it to everyone that will listen; about all the new gadgets and ideas and especially the conveniences of adequate wiring. Imagine how many people will be shown through my home.

Have You Ever

Because of insufficient outlets have you ever had to—

1. **Place a floor lamp other than in the place you wanted it?**
2. **Change your mind about the placing of an electric clock?**
3. **Deny yourself the privilege of reading in bed or else deny your wife the right to change the bedroom furniture around whenever she wanted to do so?**
4. **Run a lamp or radio cord around furniture or under a rug?**
5. **Use a hot water bottle instead of the far more satisfactory heating pad?**
6. **String 60 ft. of extension cord to light that outdoor Christmas tree?**

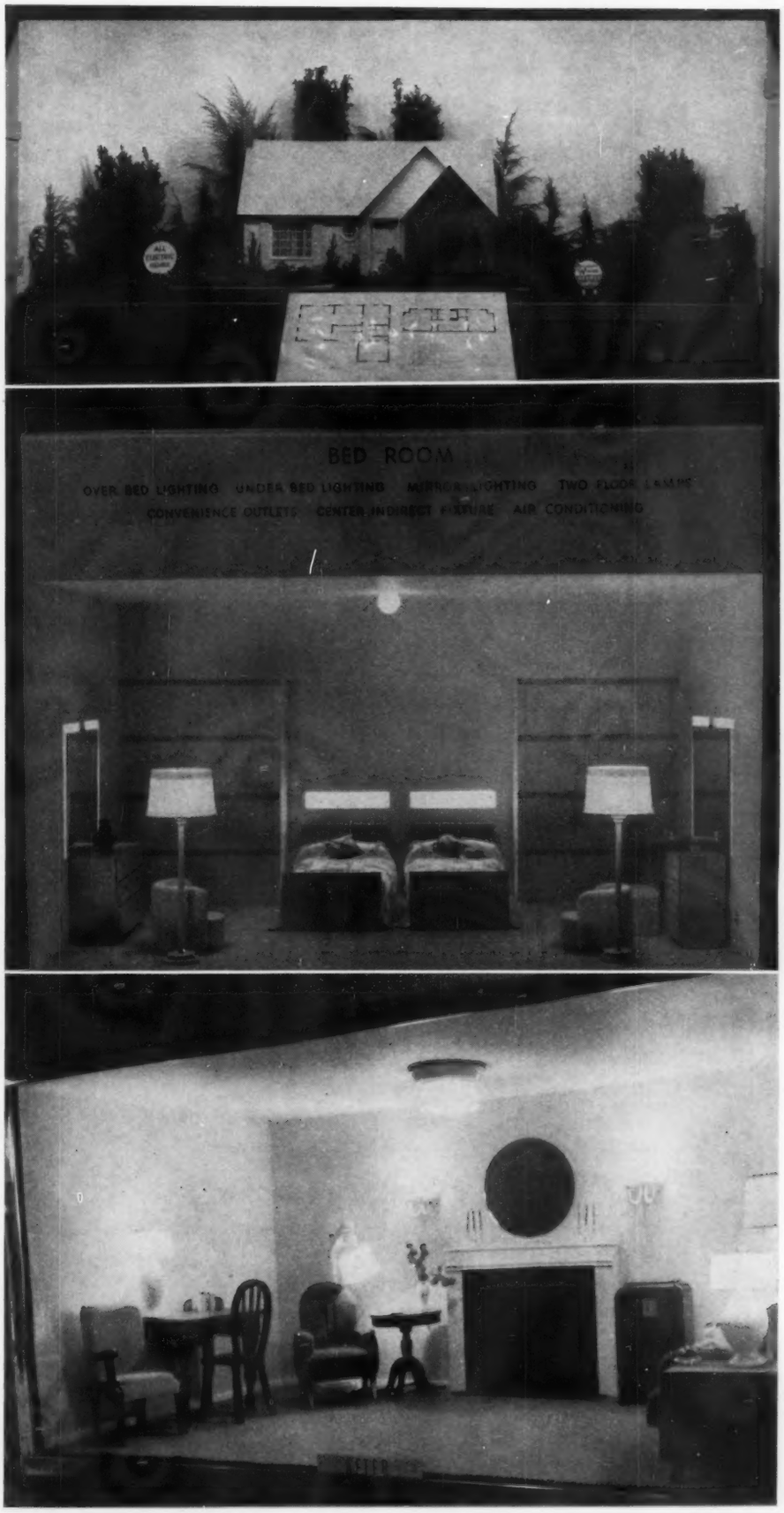
This could go on indenifitely but suffice it to say that I have done all these things.

—From T. E. Cooke's paper.

Salesmen throughout the world are forever trying to get into prospect's homes. In this case the prospect is coming right into my own home. What a cinch it would be to sell him on adequate wiring. I would take him around and show him all the outlets so handily placed. Let him try out that two-way switch. "Here is a place for a fan, and there is where I run my home movies. No, I don't have to disconnect that floor lamp each time. You see, I had adequate wiring installed."

When he leaves he is practically sold and all I have to do is to send a Red Seal man out after him the next morning. It's good advertising for the business I tell you, and best of all I'm helping myself too.

Consequently I would live only in an adequately wired home because I'm a selfish young mortal and want the best I can get.



MINIATURE ROOMS with actual working lights tell the story of adequate wiring this directiion of the sales promotion women upon invitation of school authorities.

Partial view of one day's crowd at the San Diego modern home ideas show. About one fifth of attendants were people who have recently moved to San Diego.

75,000 View San Diego Show

San Diego's fifth annual Spring Fair of modern home ideas did a lot to acquaint the incomers to San Diego with the electrical way of living. In point of attendance, about 75,000 people visited the exhibits during the six days of the show. Of this number J. Clark Chamberlain, secretary and manager of Bureau of Radio & Electrical Appliances estimated that about a fifth of the crowd was made up of new people. When crowds gathered before the platform for the prize drawings, this question was asked and the raising of arms was requested. Approximately a fifth responded each time.

"Coming as it did, just when such tremendous emphasis is being placed behind competitive products, such as automobiles, this mass example of display and demonstration of all equipment certainly proved most timely," said Chamberlain of the show.

Campaign Record

PG and E quadruples range and water heater sales during March-April drive

Four times more ranges and water heaters were sold in Pacific Gas & Electric Co.'s territory during its March and April campaign than during a similar period in 1940. Efforts of the entire industry were organized in this special promotion (see ELECTRICAL WEST, March 1941, p. 49).

In addition to the sales promotion material and advertising participation previously described, nine meetings were held in the territory of the company by A. C. Miller, appliance merchandise manager, and Geo. W. Allison of Modern Kitchen Bureau, at which 895 dealers attended. Total attendance of dealers, dealer salesmen, jobber salesmen, utility people was 2,248.

Slogan of the campaign was "Save $30 on an electric range and $10 on an electric water heater." Dealers were followed up after the initial meeting by direct calls from jobber salesmen and utility contact men. They were further contacted every two weeks to secure a record of sales made.

In advertising, remarkable results were obtained. Communities previously reporting but 18 to 20 column inches of advertising suddenly turned in records of 1,539 column inches. Another town that in 1940 had used 34 column inches reported 1,381. The PG and E advertising itself was stepped up in all media to take the brunt of the promotion.

Actual selling was slow in getting under way but increased in volume as the campaign developed. Up to March 27, 848 electric ranges and 362 water heaters had been sold, a figure comparing favorably with the 1940 March and April total of 791 ranges and 551 water heaters. April, however, really began to show results. Final record for the two months ending April 30, was 3,720 electric ranges and 1,360 water heaters, nearly four times as many ranges and three times as many water heaters as sold during 1940 for the same period.

In order to pick up a lag in water heaters over ranges, the company plans a June and July promotion on water heaters alone to enable dealers to go back and sell complete service to the homes where only electric ranges were sold. May advertising continued to feature electric cookery although the special offer was dropped.

Salesmen Wanted

Retail appliance salesmen shortage handicaps Ogden appliance dealers

The alarming shortage of good retail appliance salesmen, one of the seemingly major bugaboos and handicaps of the electrical industry everywhere, was an even greater problem to appliance dealers in Ogden, Utah.

With the influx of thousands of government workers and army officials arriving to take up duties in the many defense activities at nearby Hill Field —the West's largest warplane repair depot—and in the enormous ordnance buildings, arsenal and shell-loading plants, Ogden was faced with the problem of housing its many new citizens. This step-up in population meant increased business to merchants of household furnishings and equipment. Realizing that these specialized workers and army officials are well paid and in the larger income brackets, electrical appliance dealers were not slow to realize this opportunity and immediately began extensive promotion in newspapers and radio and sent all available sales help out to solicit the newcomers.

Soon, however, the larger home furnishing stores found themselves faced with the problem of not enough experienced trained salesmen to keep their name and respective lines of merchandise represented in the field. The first to get together on the problem were members of the Ogden Electrical League.

They first called on officials of Weber College, Ogden's largest institution of learning, with a plan which they were sure would benefit the school, its students and provide the answer to the serious problem confronting electrical appliance dealers.

Senior students were presented with the story—told what opportunities awaited those who had a sincere desire to work at the appliance selling trade. Those interested were asked to attend a special appliance training class for a three-week period, which would be instructed by sales counselors, power com-

pany officials and men who were thoroughly experienced in appliance selling. During this period they studied the theory of selling, were drilled in the "Use Story" and the "Product Story." All possible consumer questions were anticipated and discussed.

To get the women's viewpoint, Mrs. Hazel McCarty, home service supervisor for the Ogden division of the utility, demonstrated all types of appliances with caution on what words were most pleasant to the feminine ear, tips on what to say to hurry the sale to a successful close and what many of the "pet peeves" are of those who are appliance prospects. Following the close of the course all students were placed at work. Periodic training is still being continued at frequent intervals.

Ogden dealers and those in nearby localities are loud in their praise of the program and the utility, school officials and the community are pleased because these young men are making money at the work they are most interested in, and one of the appliance dealer problems has been solved.

New Focal Point

Dealer and company campaign result of PP&L $410,000 rate reductions

Another rate reduction of $410,000 to customers of Pacific Power & Light Co. was made the focal point around which a big dealer and company campaign was started in May. The rate reduction became effective May 22 and a theme of "Now electricity is cheaper than ever—enjoy more of it" was used in extensive company advertising. A dealer booklet "Cash Register Symphony," containing all the promotional material was sent to dealers and meetings were held in the various districts to discuss the rate reduction and the associated sales opportunities.

The new rates brought lower minimum charges, a new low step at 1½ cents per kwh. for residential users, a new residential water heating rate, and a lowering of the average cooking cost for the average family to $2.25 per month.

During May, June and July a campaign is being run to take full advantage of the sales opportunities created by the reduction and the general business and construction boom. Tentative quotas of major appliances are set for 2,460 ranges, 7,670 refrigerators, 1,478 water heaters, 12,426 radios, 5,051 washers, besides some 18,155 units of table appliances, 8,963 heating appliances.

In addition to dealer meetings, sales training classes for dealer salesmen, organized help from the utility's home service girls, extensive advertising, every customer of the utility will be contacted personally by the PP&L representatives to explain the new low rates, to check up on service and appliance use and repairs, and to locate prospects for sales which will be available to the dealers.

Similar activity will be carried on to stimulate the commercial and farm electrification possibilities and to recover the rate reduction in increased load. "This cut in rates is the most drastic of all reductions," said D. B. Leonard, commercial manager, "and is justified only in the belief that it will be followed by increased sales."

● Over 300 dealers and buyers attended a dinner meeting and presentation of the new Apex washing machine line on Tuesday, April 8, in the main dining room of the Merchandise Mart, San Francisco. Chairman was E. D. Hotaling, western division manager of Apex. W. H. Sheehan, district sales manager, with the assistance of D. B. Wallrich, presented the new models and promotional and advertising material.

Proctor Meeting

Over 150 northern California jobbers and retail buyers of traffic appliances enjoyed a dinner-sales meeting at the Hotel Empire, San Francisco, May 9, tendered by Proctor Electric Co. to introduce new items of the company's line, and preview promotional material designed for the coming sales season.

Charles P. Culbert, western sales manager of Proctor Electric Co., was host and spoke briefly on highlights of the new Proctor appliance line. Enlarged reproductions of consumer and trade advertising were displayed to illustrate the company's cooperation with jobbers and dealers, and the Proctor advertising program for summer and fall was outlined. According to Culbert, any dealer who will carry one set of appliances (8 items) is entitled to a 50% advertising contribution. Half the cost of local space carried by dealers is paid by Proctor, and promotional material of wide variety is offered.

Demonstrations, according to Culbert, are part of Proctor promotion policy. Three types are employed: full-time demonstrations in one large store; "share" demonstrations with another line and "roving" demonstrations where one or two days is spent in an outlet each week. A new model "never-lift" iron, Proctor's top iron, which has in addition to its spring-lift mechanism, an electric light in the front of the iron and a glow-light in the back; an attachable steam unit fed from a separate water reservoir was demonstrated by Culbert.

Sam Vining, manager of sales promotion for Proctor, was next called to give his unique demonstration and philosophy of selling, with particular reference to electric irons. Vining, whose histrionic talents have enlivened sales meetings from coast to coast, observed that the primary rule of any selling job was to "ask an intelligent question—don't try to be a mind reader". By means of several anecdotes, he pointed out that the important thing was to tell the whole story to the customer, and let *him* pick out the price and size of item desired. ". . . and probably he will purchase a better item than you dared suggest" Vining concluded.

Topping his speech, by special request, Vining spun a sad tale of the overworked housewife swinging a heavy iron hours on end—and then proceeded to cook an egg and some bacon (see cut) on the iron, to point out that if she couldn't stop working, she could at least have some nourishment during her ordeal. "I dare anyone who has seen this to forget it if he ever again tries to sell a cheap iron," he concluded.

Charles P. Culbert (upper picture) demonstrates how jobber salesman should present new merchandise to customer-retailer; while Sam Vining (below) beams over bacon and eggs frying on iron (see story).

In High Gear

Montana Power appliance push features advertising allowances to dealers

In Montana the annual electric cookery and water heating campaign is well under way. Started March 17 and to run to July 31, inclusive, the campaign covers electric ranges, toasters, hot plates and water heaters with the Montana Power Co. and electric dealers participating.

Montana Power itself is featuring the Westinghouse Commodore at $114.50 installed and an Electromaster three unit and cooker model at $86.50 installed. Prices are designed to include wiring in ordinary installations. Where extraordinary conditions require higher wiring costs, the difference between the average installation and the particular cost will be charged.

Dealers are receiving a special advertising allowance of $10 for each new range sold on the company's line. This applies only to ranges sold during the campaign and not to those sold on REA or other lines. Regular sales prices are maintained for roasters, hot plates and water heaters.

During the campaign special terms on electric ranges offer a down payment of $5 and the balance in 24 months, including carrying charges. Extensive advertising is carried by the power company in newspapers, on 54 billboards, in bill inserts, and handout literature.

On April 12 after four weeks of the campaign, 277 ranges had been sold of which the company sold 180, dealers 97; 18 roasters of which the company sold 7, dealers 11; 137 hotplates of which the company sold 1, dealers 136; and 20 water heaters of which the company sold 5, dealers 15.

Vision Week

Save Your Vision Week received a real boost in Portland, Ore., this year, where excellent cooperation by power companies, optometrists, school authorities and the traffic division of the police department produced a live, educational program.

Initiated by James B. Buman, manager of residential and farm sales for Northwestern Electric Co., the event was officially sponsored by the American Optometric Assn., with Dr. Robt. Burdette as chairman; Earl F. Campbell of the traffic safety commission, vice chairman.

Representatives of Portland General Electric Co. and General Electric Lamp Division aided in outlining the activities. Advertisements (8) were run over the signature of NW Electric Co., Oregon Optometrists' Assn. and Oregon State Board of Examiners in Optometry; 49 talks were given before community clubs, 29 before civic organizations, 92 parent-teachers' groups and 22 veterans' posts. Sixteen articles and two editorials appeared on various phases of the program—in all 480 column inches during the week. Radio talks and spot announcements also contributed to Vision Week success, as did 32,000 pamphlets on Better Light- Better Sight to school children of Portland. Floor displays were maintained by power companies.

On Thursday of Vision Week, the N W Electric Co. staged a display of magic in one of its windows, the professional magician promising to deceive the eye in spite of "adequate illumination." This program received special newspaper publicity.

● ACTION recently taken by dealers of the Electrical League of Utah has resulted in adoption of the "blue book" of the National Refrigerator Market Report, Inc., by dealers of the Salt Lake, Ogden and Provo areas.

Up to the present, the League office has distributed some 90 copies throughout its area at a price of $2 (members $1.50) in its program to assist dealers in giving fair trade-in value to used refrigerators. In a message to all electrical dealers, said League dealer chairman Hollingworth, "With future shipments of new refrigerators uncertain and with prices on many new models increasing, it is imperative that all dealers study the situation carefully with the view in mind of making a larger percentage of net profit from the sale of used merchandise."

● HOME SERVICE staff of Pacific Power & Light Company held its recent annual conference at Walla Walla. It was conducted by Audrey Herrington, director. Cula Baker, Hotpoint home economist, made demonstrations on the replica of the millionth Hotpoint range. Other speakers on various phases of home service were on the program.

● MORE than 900 automatic electric storage water heaters were sold in April alone to Seattle City Light customers, according to P. C. Spowart, sales manager, and more than 500 electric ranges to City Light customers during the last week of April alone. On May 1st, the sales tax increase spurred a good deal of this buying. City Light was staging, early in May, an anniversary party in commemoration of the one millionth Hotpoint electric range. The anniversary celebration, held at the City Light Auditorium, was conducted by Merle Bryan who displayed table arrangements appropriate for a first anniversary, a 15th and silver and gold anniversary dinners.

● THE FIFTY-SECOND consecutive Western Homes Furnishings Market will be held at Western Merchandise Mart in San Francisco, Aug. 4-9. "Six Markets in One" will be its theme. One highlight event will be the 14th Western Radio and Appliance "Trade Dinner" on Wed. eve., Aug. 6. Nationally known speakers and professional entertainment will be headlined.

● BERTOGLIO-MCTAGGART of Butte, Mont., opened a larger and more modern appliance store at the northeast corner of Main and Granite Streets.

Campaigns

Puget Sound Power & Light, May, a cooperative "He-man Cook" electric range campaign.

Mountain States Power Co., May, electric range campaign.

Northwestern Electric Co., May electric range campaign.

Northwestern Electric Co., May electric range campaign.

All of the above mentioned electric range campaigns have been built on the Modern Kitchen Bureau's spring He-Man Recipe Round-Up and electric range spring showing plan.

Washington Water Power Co., May-June, "Hit the Jackpot", a residential commercial campaign on all-service sales.

Electric Appliance Society of Northern California, May-June, small electrical appliance gift campaign.

Nevada-California Electric Corp., June-July range campaign.

Southern Colorado Power Co., June, range and water heater campaign.

Southern California Edison Co., Father's Day, June 15, sunbeam Shavemasters campaign.

Pacific Gas and Electric Co., May, air conditioning campaign, and electrical gift campaign from May 26 to June 7.

Pacific Power & Light Co., May-June, electric service campaign.

Utah Power & Light Co. and subsidiary Western Colorado Power Co., June and July, hotplate and roaster and adequate wiring campaigns.

"UNCLE SAM'S CHOICE for defense housing is electric refrigeration." With such a slogan, the Bureau of Radio and Electric Appliances at San Diego County launched its usual spring refrigeration advertising campaign. Ads tell of the specification of electric refrigeration for all of the Army and Navy and defense housing projects in the region.

PRINT IN BINDING

ELECTRICAL WEST Sales Guide

Back to Work!

Last year you sold roasters so that folks would have more time to play. This year sell them to give folks more time to work at important national defense jobs. That shows you how versatile an electric roaster is, how much needed in good times and bad, by well-to-do and workmen. For men are going back to work every where. Women are taking up Red Cross service and even filling in on defense jobs where they are needed. All this means that good warm meals must be simplified. Often because of shift work foods must be kept hot for late workers.

On farms, even, there is more to do these days to help feed the world. In communities removed from defense projects there is still a need for the handy everyday services of a roaster. The market is everywhere and more people are in the market for one than ever before.

In their spare time, their rest time, people at work everywhere will relish the out-of-doors, will like to go on picnics, enjoy a meal outside. What time they have for play and relaxation they will want free from kitchen cooking bother, in hot weather especially. The roaster has as many appeals as it has uses. While much of your demand will come without much effort, and sales may exceed your supply at times, your customers will get far more useful value and you will get more selling satisfaction out of the fully automatic models. That kind of selling is fun—turn the page and see.

ELECTRIC ROASTERS

JUNE 1941

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ROASTER

Selling is fun

WHEN YOU KNOW YOUR STUFF!

Ask her

"What kind of Cooking?"

You'd like all your prospects to feel that they wouldn't buy from anyone else but you. Remember then that when you talk to the prospect you are making friends. Show a real interest in her family, what they like to eat.

Instead of the usual meaningless, "Can I do something for you," start right in by asking "What kind of cooking do you and your family like?" (Even if she is unmarried and is buying for a wedding gift for some girl friend, the question may strike her because it shows interest in **her.** At least it will give you a clue.) Coax **her** to do the talking. Find out what she needs or wants or likes.

In answering the questions you stir up, make your answers simple. Don't be long winded. You wouldn't like listening to yourself either if you are. Find out something about her family, their various tastes—for roasts, or baking, or picnics or special diets. Find out what she likes to serve. Then sell the roaster for its ability to satisfy just exactly those needs or desires.

When you have learned what sort of meals she likes for what size and sort of family, select from the following list those appeals and uses which will interest her, accomplish what she wants. Show her first how the

roaster will cook the kind of food she is interested in. Then add from this list the **plus uses** and **values** that make the roaster the real bargain it is at any price. Tell her the whole story if you can, by leading her to ask for it, then let her make up her mind which model she wants. Nine times out of ten she will select a better model than the one you might have thought she would. Remember always that she can buy a lot of other things from other people than you with the money she has if she feels like it. So make friends. You'll make more and higher sales and find real fun in selling.

Besides the baking, boiling, stewing, steaming and frying, and broiling too, the roaster offers all these **extra** values and uses - - -

Cooler cooking in hot weather—just as in an electric oven, the heat stays inside.

Cleaner cooking at all times because like electric light, electric cooking is clean. Controlled temperatures prevent foods from burning to the utensils under ordinary care. The shell can be washed with the dishes, the exterior wiped clean with a damp cloth. The walls will not smudge with cooking smoke.

Healthful cooking because the flavors are saved and mineral juices retained. Tough cuts are made tender. It's waterless cooking, vegetables are steamed and the vital elements are sealed in.

It is portable—that means a lot. For instance, it means that cabbage can be cooked in it out on the porch so that its odors will not fill the house. It can be taken on picnics with food still hot in it. It can go with you on vacation. You can take warm foods in it to grange or church social. Serve from it right at the table, keep second helpings warm. No need to leave your guests or table.

No watching needed. It can cook while you shop, attend to other affairs, do other things.

Space saving. It is ideal for a small apartment or kitchen. It is an electric range in itself and is useful to supplement the range on big special dinners. Takes little room. Requires no special wiring.

Has a lot of extras uses, such as deep fat frying of doughnuts, French fries, etc. It is fine for canning and preserving. It's fine for the long cooking of cereals, soups, roasts. Can be used to sterilize dishes, bottles for baby, or to heat water in emergency, keep hot packs hot. It is ideal for serving hot meals to an invalid.

Really economical—with thermostatic control to save current, and the very low electric rates everywhere these days, and roasters so low in cost and easy to buy.

and We'd like you to Succeed at it!

PUGET SOUND POWER & LIGHT CO. • WASHINGTON WATER POWER CO. • PORTLAND GENERAL ELECTRIC CO. CALIFORNIA OREGON POWER CO. • UTAH POWER & LIGHT CO. • IDAHO POWER CO. • THE MONTANA POWER CO. • ROCKY MOUNTAIN ELECTRICAL LEAGUE

"Stuff" to Know

Prevents complaints too--

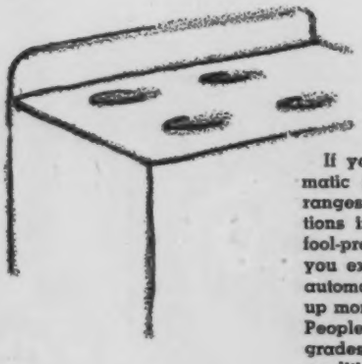
Real salesmanship, selling that is enjoyable, is the kind that generates no complaints to bounce back after the sale is made. To know in advance what might cause such bounces is to be prepared to avoid causing them. A recent check-up by a womens' magazine discovered the following things salesmen can watch and sell in a way that will bring only satisfaction and pleasure.

While a roaster will make tough meats tender, be sure to explain that the better the quality of the food put into the roaster, the more delicious the results. A roaster will help the taste of any meats, but it will do its best on better meat.

Make clear to the customer that the broiling unit is extra, if it is. Several women expressed disappointment and claimed they were led to believe they were to get a broiling unit too. The average woman thinks thermostatic means automatic. Explain that thermostatic control means heat control but that only the fully automatic roaster will turn iself on and off.

Explain the distribution of heat so that there will be no complaint from overdone or underdone foods because wrongly placed. The proper sized pan often has a lot to do with success.

Learn to cook yourself, and you can tell and sell with more conviction.



Speaking of cooking---

If you sell ranges the fully automatic features of the new electric ranges are way ahead of all imitations in simplicity and accuracy of fool-proof operation and safety. If you explain the real worth of these automatic capabilities you can step up more sales now than ever before. People are ready to buy better grades, especially more time saving qualities and helps.

Time--all the time

Any time is always electric clock time. These clocks are so attractive, reliable and inexpensive that they sell as gifts all year round. But there is a new opportunity opening up for the sale of electric clocks now.

With the return to work of so many thousands of people who were on relief, work at high wages, the luxuries they wanted but could not afford are going to be in demand. Clocks are not sheer luxuries by any means. Some kind of a timepiece is almost a necessity. But many will want an electric clock.

Then too, alarm clocks, the electric kind, should be in better demand as more people get jobs, especially if shift work is started, with work and sleep at odd hours. This is the time to advertise and sell the electric alarm models as never before.

Even those automatic clocks designed to tell time and to turn something on or off at a set time will be needed more to control roasters or appliances for busy people who need these automatic electric servants to start breakfast or lunch or dinner for them.

Most homes can use several clocks, one for the kitchen surely, one for every other room in the house. There is real opportunity in clocks.

"Stuff" to do

COMMITTEE REPORTS

Northwest Electric Light and Power Association

1940-41

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Business Development Section*

Introductory Statement

By DARYL B. LEONARD
Pacific Power & Light Co.

THE Business Development Section commenced its year's work with a meeting of its Advisory Executive Council in Portland Sept. 20, 1940. Here the section completed its organization into bureaus, set the tentative dates for the annual section meeting in Spokane, and authorized the 6th annual Commercial Sales Conference.

This Commercial Sales Conference was held at the Heathman Hotel, Portland, Nov. 13-15, 1940, under the chairmanship of A. H. Greisser, Portland General Electric Co., chairman of the Commercial & Industrial Sales Bureau. There were 84 delegates present from seven member utility companies and 19 manufacturers, jobbers, dealers and advertising agency men.

At this conference, which extended over three days, one day was devoted to sales training in the commercial cooking and heating field; and two days to fluorescent lighting. The customary $2 registration fee was charged, and a mimeographed report of the proceedings was distributed to delegates and others as usual.

The Bureau's 1940 Data Sheet program was brought to a close by the publication in December of Data Sheet No. 39, the twenty-fourth for the calendar year. In the subsequent judging of the two contests, one for data sheets on commercial cooking applications and one for data sheets on miscellaneous heating applications in commercial and industrial establishments, the following were declared winners: Commercial Cooking, first prize, J. E. Dugan, Puget Sound Power & Light Co.; second prize, Alex E. Lacroix, The Washington Water Power Co.; third prize, O. C. Rawlings, The California Oregon Power Co.; and honorable mention, C. W. Brissenden, Portland General Electric Co., and Lloyd Steele, Puget Sound Power & Light Co.; Commercial & Industrial Heating, first prize, W. L. King and Carl L. Hoffman, The Washington Water Power Co.; second prize, H. Van Wyk, Puget Sound Power & Light Co.; third prize, T. N. Hunt and Albert Gruber, The Washington Water Power Co.; honorable mention, N. J. Mahar, The Washington Water Power Co., and E. E. Haroldson, Idaho Power Co.

Plans were set in motion for the continuance of this program in 1941.

The sixteenth annual meeting of the Business Development Section was held at the Davenport Hotel, Spokane, March 27-29, 1941. Two full days, Thursday and Friday, and one-half day on Saturday were devoted to general sessions and bureau and committee conferences delving into all phases of utility load building and selling. The meeting opened with a general session Thursday morning, closing at noon. In the afternoon concurrent sessions were conducted by the four bureaus: Advertising, Commercial & Industrial, Residential, and Rural, conducted respectively by their bureau chairmen. Friday morning the bureaus continued their concurrent conferences, and the Residential Bureau split into separate conferences of its respective committees, Home Modernization and Home Service, making five conferences on this day. These conferences extended over into the middle of Friday afternoon when the entire group again gathered in general session to hear bureau and committee reports. These reports were concluded during the final general session on Saturday morning, after which the meeting closed with two inspirational addresses.

LEONARD

In the following pages a summary of each of these conferences is presented along with several of the written papers that were read by participants. Some of the talks presented at the general sessions are likewise printed. Below is a resume of the program of the general sessions.

The Thursday morning session opened with a word of welcome from F. G. Sutherlin, mayor of Spokane, who told how the Inland Empire has pioneered in three vital services for community growth—transportation, communication and power. Mr. Sutherlin was followed by Kinsey M. Robinson, president of The Washington Water Power Co., offering a welcome on behalf of the electrical industry of Spokane. Responding to these addresses of welcome was S. P. MacFadden, Puget Sound Power & Light Co., vice-president of the association, with an inspiring resume of some of the accomplishments of the electrical industry of the Pacific Northwest, which is printed in the following pages.

The theme of "national defense" was here introduced by George H. Wisting, Northwestern Electric Co., in his address titled, "Power for National Defense," also printed hereinafter. This talk was followed by an exposition of what the electrical utility industry in Canada is facing due to the war conditions under which it is now operating, by E. W. Bowness, vice-president, Canadian Utilities, Ltd., Calgary. Mr. Bowness came as a representative of the Canadian Electrical Assn. of which G. A. Gaherty is president. He was able to bring to us on this side of the line some very pertinent information as to how an all-out defense effort such as Canada has been embarked on for the past 18 months can affect a vital industry such as the power industry. Extracts from his remarks are printed in the following pages.

When the meeting again convened in general session after the bureau and committee conferences broke up at 3:30 p.m. Friday, three committee reports were offered. J. Harvey Leach, Puget Sound Power & Light Co., chairman of the Advertising Bureau, reported on the conference of the advertising men, and introduced Ashton B. Collins, creator of Reddy Kilowatt, whose remarks are published under the report of that bu-

*Advisory Executive Council: D. B. Leonard, Pacific Power & Light Co., chairman. D. J. McGonigle, The Montana Power Co., vice-chairman. B. C. Electric Railway Co.: W. C. Mainwaring; The California Oregon Power Co.: Glenn L. Jackson; Eastern Oregon Light & Power Co.: LeRoy A. Grettum; Idaho Power Co.: Ralph E. Gale; Mountain States Power Co.: Harold E. Farris; Northwestern Electric Co.: George H. Wisting; Portland General Electric Co.: Ben W. Faber, A. H. Greisser, A. C. McMicken; Puget Sound Power & Light Co.: J. Harvey Leach, C. Patrick Johnson; Utah Power & Light Co.: W. A. Huckins; The Washington Water Power Co.; Ross B. McElroy; Edison General Electric Appliance Co.: J. C. Platt; Hurley Machine Co.: R. G. Chamberlain.

reau. Ben Faber, Portland General Electric Co., chairman of the Rural Sales Bureau, reported on his conference, introducing a skit to bring out the methods now in general practice among Northwest utilities for dealing with farm service. The Home Service Committee report was rendered by W. A. Huckins, Utah Power & Light Co., chairman, assisted by Edith Rauch, Puget Sound Power & Light Co., Lucile Ramirez, The Washington Water Power Co., and Dorothy Stewart, The Montana Power Co.

Saturday morning's general session opened with a report of the Commercial & Industrial Sales Bureau by A. H. Greisser, Portland General Electric Co., chairman, assisted by C. T. Bakeman, Puget Sound Power & Light Co. A feature of Mr. Bakeman's report was a spectacular demonstration of the high intensities and different qualities now obtainable by fluorescent lighting, using both inanimate and living models to show how these different intensities and qualities affected the natural appearance of peoples' complexions and clothes and the appearance of different kinds of merchandise found in stores.

The report of the Home Modernization Committee was presented by F. A. Tool, The Washington Water Power Co., chairman.

The session closed with two inspirational addresses, one by Eric A. Johnston, Columbia Electric & Manufacturing Co., Spokane, and one by Kinsey M. Robinson, The Washington Water Power Co. Mr. Johnston, talking on the subject, "Effect of Defense on Manufacture of Electrical Equipment," pointed out how priorities would affect the manufacture of electrical appliances, how the use of plastics as substitutes for previously used metals would increase, and how the six chief elements in plastics are available in the Pacific Northwest. He closed with a reference to the social changes taking place in the nation at large, and closed on the optimistic note that changing times are always bad for him who is willing to accept defeat, but for him who is willing to fight, maintaining his ideals, there will be victory.

Mr. Robinson referred to the importance of salesmen and sales organizations in the trial the industry is now facing. "You must sell," he said, "to get back the revenue being whittled away by increased taxes and forced rate reductions, and you must sell your product in such a way as to gain the good will of the customers. We are in a sound and legitimate industry that has, with very few exceptions, always had the general economic welfare of the public it served in mind. We owe an obligation to the people of this country in this public power fight. America and our democracy has been built by private enterprise."

Recorded attendance at the meeting totalled 241 with 165 delegates coming from outside Spokane and 76 from Spokane.

Some Industry Accomplishments

By S. P. McFADDEN
Puget Sound Power & Light Co.

THE Northwest Electric Light & Power Association is unique in the history of the light and power industry of the United States. Organized in 1908 prior to the old N.E.L.A., it joined the latter organization, but as a separate and independent unit. Then when the N.E.L.A. went out of existence, our association continued as a separate and independent body. Our member companies and their predecessors pioneered the long distance transmission of electricity and the interconnection of electrical systems in order to increase benefits to the customers. The first long distance transmission line, and for those days it was sure enough long distance, not only in the history of this section of the country but in the history of the world, was the transmission line of the Portland General Electric Co., extending from the falls of the Willamette to Portland. By 1911, long distance transmission was the order of the day here in the Northwest. Some of the old timers who pioneered these installations are still with us.

As a result of this pioneering, some of the smaller communities were receiving service far ahead of the date when similar communities were receiving service in other parts of the United States. A few years ago I secured statements from old timers in some of the communities regarding the service prior to our company's serving them. Here are excerpts from a few of those statements.

From a citizen of Wickersham: "While we operated on a 24-hour schedule, during certain periods of dry seasons it was necessary on account of low water conditions to limit the use of appliances, such as irons and washing machines. This was handled by agreement as to the number of customers who could use appliances on certain days."

From a Granite Falls resident: "I was asked many times by the Granite Falls company to shut down my ice machine when it was time for the picture show to start, as the system was not able to carry both loads at one time."

From a Langley pioneer: "During time of old company, the lights winked at 10:45 p.m. as a warning that they would be turned off at 11:00, and in the midst of any party or entertainment a mad rush was made to get either kerosene or gas lights ready. There was no current in the daytime except two hours two days a week for washing and ironing, and if this was not done at that time it had to be done by hand."

From another Granite Falls settler: "The power was off very often and the excuse of the electric company was always that salmon had gotten into the wheel at the plant."

One of the Northwest companies built the first rural electric line ever constructed in America. Puget Power claims that distinction. So do at least six other companies. Not being a Solomon, I am not prepared to pass on the relative claims of the various utilities or their predecessor companies which are now members of this association, but it goes without question that one of these utilities or its predecessors built the first rural line not only in America but in the world.

Following the construction of these early rural lines, the members of the association were the first to recognize the fact that the real opportunity to do a constructive job was not the extension of electricity to rural areas in order that the farmer might have electric lights, but rather to help the farmer increase his efficiency by substituting electric power for manual labor and to do things to help himself, through use of electric power, that he otherwise could not do.

George Hughes, the father of the electric range, is admittedly the pioneer of electric cooking, but the experimenting was done here in the Northwest. Electric cooking started here. The member companies of the Northwest Association worked with him in building up this load. The electric range, as a result of his genius and efforts, was an accomplished fact in the Northwest before it was even thought of anywhere else. When the old N.E.L.A. discovered the electric range, they made a study to determine the economics of electric cooking. There was just one place where the study could be made and that was here in the Northwest, and, as a result of that study, electricity is the preferred cooking medium of the housewives of the United States today.

Then came electric water heating. Where was that developed? It was developed right here in the Northwest. Our engineers and our sales organizations, recognizing the advantages of electric water heating, promoted the idea and, in addition, again developed new equipment. Our own heaters, de-

signed by our own engineers, pioneered electric water heating in the United States and today we are still ahead of the rest of the country.

At this point I want to point out that manufacturers cooperated and are cooperating 100 per cent in the development of equipment for the utilization of electricity for cooking, water heating and all the other purposes for which electricity is used today. Without them we would have gotten nowhere. Had they been hidebound and reluctant to take a chance, the electrical development of the entire country would have been retarded.

The utilities of the Northwest have spent substantial sums of money in the development of equipment to utilize electricity on the farm for the benefit of the farmers. They have placed in effect extremely liberal line extension policies. As a result, no other section of the country has such a high degree of rural electrification as the Pacific Northwest. Many of the counties have from 95 per cent to 100 per cent of farms electrified.

Northwest Rates Lowest

In the matter of rates, the Northwest leads the nation, and this is true whether we consider only the privately owned utilities or both privately and publicly owned utilities. This is the result of interconnection, efficient operation and sales effort in increasing average domestic and farm consumption. This is borne out by the statistics of the Federal government which show that the average annual consumption per domestic customer is higher in the Northwest than anywhere in the United States.

Rates have been constantly decreasing. Certain departments of the Federal government like to claim that these reductions are the result of the so-called yardstick plants which have been built, but who ever heard of the yardstick plant in 1901 and 1902? The utilities in the Northwest have been reducing rates since before the turn of the twentieth century. The statistics of each and every company prove this. As to our company, the first plant was constructed about 1888 and there were a number of reductions between 1888 and 1906 or 1907, when our principal competitor, who claims the credit for all rate reductions, was first instituted. I am sure that you will all agree with me that even assuming (which is not true) that Puget Power's rates from 1907 to 1933 followed from the operations of our principal competitor, the yardstick department cannot claim credit for the reductions made by other member companies during the same period.

We hear a great deal today, and have for the past few years, about interconnections, super power systems, and *grids*. In fact, when the present administration at Washington first came into power they heard about the English grid system and they passed a bill appropriating some money and appointing a commission to go to England and find out all about this English grid system. The commission went to England, they studied the system, they came back and they reported that we had to have a grid system and that it would have to be developed by the Federal government. I don't need to tell you folks that the English grid system resulted from a commission appointed by the British Parliament, who came to the United States to find out how to bring the level of electrical development in England up to the level then existing in the United States; that that commission when they got to the United States, after making inquiries, came to the Pacific Coast and to the Pacific Northwest and got their information on how to develop the efficient generation and transmission of power and the interconnection of systems from George Quinan of our company, Henry Senger of Idaho, Harry Cochrane of Montana, Harry Schoolfield of Pacific Power & Light, O. B. Coldwell of Portland Electric Power Company, Victor Greisser of Washington Water Power, and others.

During the past 20 or 21 years, the forces of socialism and all the other "isms" (except Americanism) have been attempting to socialize the utility industry. At first they didn't make much progress, then progress became more rapid. We have seen PUD's organized in most of the counties of Washington. We have seen various municipal enterprises, tax-free or relatively tax-free, advance their claims for public power. We have been through some tough years. It is only the indomitable spirit of the men and women who make up the utility organizations, their knowledge of what's what, and their training, that have kept the private utility industry from sinking.

Must Sell Bonneville Power

The Bonneville and Grand Coulee power plants are here. They are not a gift from the Great White Father. You and I and all the rest of the people of the Northwest, our children and their children and their children's children are going to pay for our share of them, along with our share of the hydro-electric plants in Nebraska, the Santee-Cooper project in the Carolinas, the TVA and now it looks like also the St. Lawrence. It is our job to do everything we can to distribute this power to the people, passing on to the people all the benefits resulting therefrom. At the moment there is supposed to be a power shortage because of the use of Bonneville power for national defense purposes, but if there is, it is certainly only temporary and, if there is, by the summer of 1942 it appears as if we would have power to burn.

Not only as utility people but as loyal citizens of the United States, it is our duty to promote the maximum utilization of this power for the benefit of the citizens of the Northwest and for all the taxpayers of the United States. I do want to point out here, however, that had Bonneville and Coulee not been built, the private utility industry of the Northwest has planned for years and would have built and is in a position to build and furnish the power now being or about to be generated at Grand Coulee and Bonneville.

Perhaps this might sound a little wild to anyone not acquainted with the facts, but many of you are intimately familiar with the facts. My company, Puget Power, has Rock Island with an ultimate rated capacity of about 200,000 kw. and only 60,000 kw. rated capacity installed. Our White River plant with 60,000 kw. installed is designed and built for much greater capacity. The same is true of our Baker River plant, Inland Power & Light Co.'s Ariel plant, the Washington Water Power Co.'s Chelan plant, the Portland General Electric Co.'s Oak Grove plant, and others. Also Seattle City Light has its Skagit; Tacoma City Light has the further development of Cushman or La Grande or the initial development of Packwood. And here is the astounding thing—the cost on a kilowatt-year basis from any of the additional plants I have mentioned is less than the world famous rate from Bonneville—namely $17.50 per kilowatt-year—and I am talking about the cost delivered at load centers.

Isn't it a terrible thing that at a time when we are talking about national defense and national unity and, theoretically at least, bending every effort to speeding up production, so much time, money and effort on the part of so many people, is taken up with the present fight between so-called private and public ownership? At the present moment our company has a large corps of experienced, competent engineers engaged in counting poles, valuing transmission lines, for the purpose of determining the value of our system in various counties, to be presented in court so that a jury may determine the value at which the PUD, if it sees fit, may take over our property. Those same engineers could far better spend their time assisting in speeding up production for defense.

However, the tide is turning; the pendulum is swinging. As an indication of this, I want to read you an

extract from a speech made on the Senate floor in a recent debate, as quoted on page 1632 of number 40 of volume 87 of the Congressional Record, as follows:

"Laws are not always construed as their authors intended. The Federal Communications Act was construed in a way absolutely contrary to the intent of those who drafted the law. I call attention to the fact that at times the Utility Holding Company Act has been construed contrary to the views of members of the Senate, expressed upon the floor of the Senate."

As Ripley would say, believe it or not, the extract of the speech I have just quoted you was made by Senator Wheeler of Montana, co-author with Congressman Rayburn of the Wheeler-Rayburn bill, the so-called Public Utility Holding Company Act, which contains the so-called "death sentence" clause.

The utility industry is having all kinds of troubles—public power fights, death sentences, and what not—but the personnel are all loyal Americans. Their symbol is the American eagle, and the country can rest assured that the utility industry will do its part and more in the emergency the United States is facing today.

Power in National Defense

By GEORGE H. WISTING
Northwestern Electric Co.

THE ELECTRIC power industry is ready now to deliver power where it is needed, when it is needed, and in whatever quantity it is needed, without asking the American taxpayer to spend a single dollar. The reason that we are ready is because we have become accustomed to emergency demands. A very definite transition has occurred in American industry since the last war—we have moved from the mechanical age into an age of electro-chemistry and electro-metallurgy; and since electric power represents the nervous system of American industry, we have had to do, in effect, tomorrow's work today in order to be ready whenever the demands presented themselves.

We are ready in terms of capacity to generate, capacity to transmit; and we are prepared with an organization of 300,000 men and women whose experience, at an average of 15 years each, represents 4,500,000 man-years of experience in operating this vital industry, which we are now ready to place at the command of our government in preparing to meet the emergency with which we are confronted. We are ready with money, because the record of performance of this industry over a period of 50 years is such that channels of credit are opened when needed.

Fig. 1

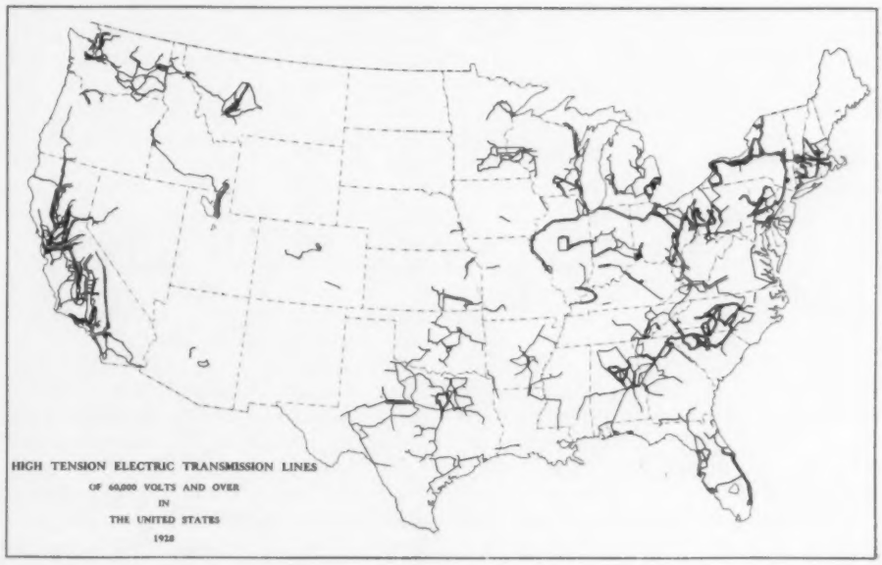
With the assistance of a number of charts, I wish to reveal the progress that has been made since 1918 and the conditions as they exist today insofar as our ability to serve is concerned.

Fig. 1 reveals the extent of the transmission system of the United States as it existed in 1918, as you will recall, was the close of the last war. In preparing the charts we have used 60,000 volts as the minimum, because that is a voltage reasonably well within the limits of successful long-distance transmission. Many lines are constructed for much higher voltage, but this is a reasonable basis for our study. You will note that the extent of the interconnected transmission system of that year was quite limited. I point with pride to the Pacific Northwest which, with California, leads in the development.

Fig. 2 shows you the transmission system in 1928, 10 years later. You will notice how extensively the system has developed in this short period of time, particularly along the Atlantic seaboard, Middle West and the Pacific Northwest.

Fig. 3 shows conditions in 1933—a very fateful year for the power business, and I am rather impressed with the feeling that history will reveal that it was a fateful year for American business in general. That was the year when government decided that it wanted to pitch the ball as well as umpire the

Fig. 2



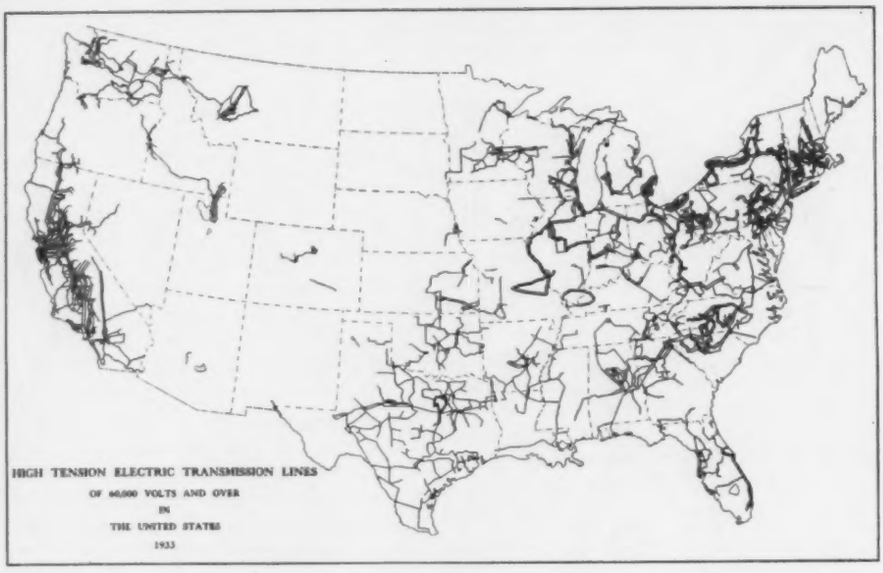
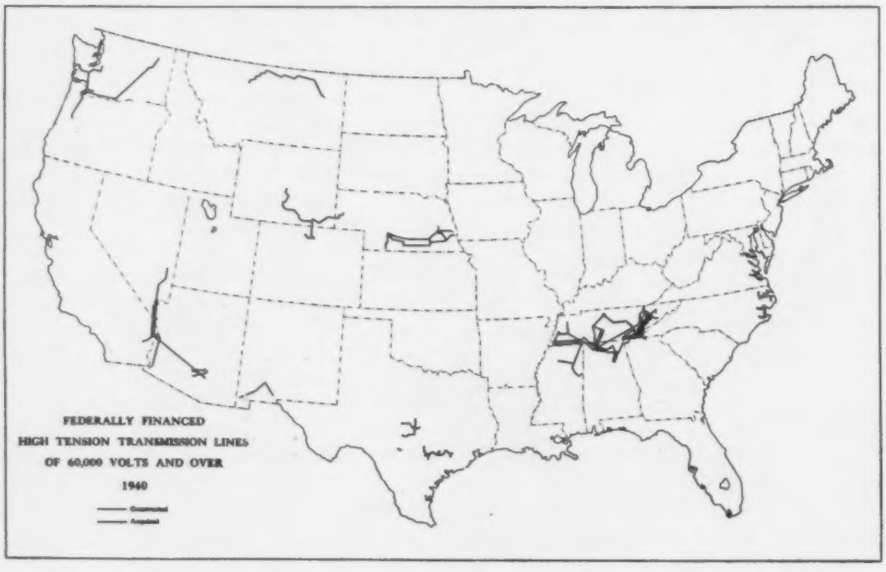


Fig. 3

game. In other words, that was when the government stepped from its fundamental position as laid down by our founders, of being the referee of the conduct of American business, and moved into business itself. You will see that since 1928 the development has been extensive and in 1933 the country is pretty well covered with a network of transmission lines.

Fig. 4 reveals the high tension electric system of 1940. Practically the entire country is covered with a network of lines, excepting, of course, the Plains states and the mountain tops of the Rocky Mountain states. For all practical purposes, it is possible to transmit energy from one end of the country to the other. This map represents 83,000 circuit miles of transmission lines of 60,000 volts or more.

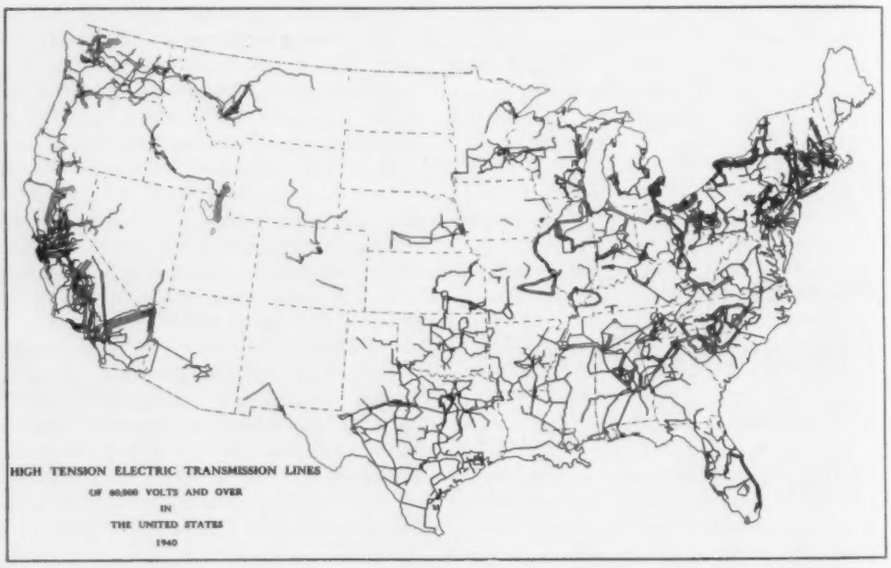
Fig. 6



If we reduced the voltage to 11,000 volts, there would be 300,000 circuit miles, or enough to wrap around the earth's equator 12 times. I want you to know that 90 per cent of this transmission system was built by private industry and approximately 10 per cent by municipal and federal projects.

(Three Figures—not reproduced—showed the extent of the municipal high tension system in 1933 and 1940 built by the municipal companies and the federally-financed lines in 1933.) In 1940 for the first time there is a municipal transmission line which crosses a state line here in California, where the Los Angeles Bureau of Power and Light picks up its power from Boulder Dam. There has been some development in the Northwest in the lines connecting Seattle City Light with the Skagit project. I would remind you that municipal plants, as such, are not a new idea. There have been municipal plants in operation from time to time as long as the industry itself has

Fig. 4



been established. In all, there have been more than 3,700 municipal plants established in the United States, of which slightly more than 2,000 are now in operation. And yet, this is the extent of their contribution to our integrated power system. The reason, of course, is obvious: first, because many of the provincial laws of our communities are not flexible enough to permit interconnections; and second, the jealousies existing, wholesome as they are in contributing to progress in peace time, do not lend themselves to integration and unification. You will observe that there would be a tragic inadequacy existing today if we depended upon the municipal systems to assist one another as emergencies presented themselves.

Fig. 6 shows the extent of the Federal government's transmission lines in

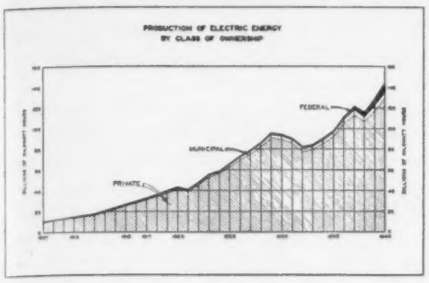


Fig. 7

1940. Some in Texas and the T.V.A. area were purchased from private companies. Again I remind you that if American industry were dependent upon the federal lines, there would be a tragic shortage of facilities to move energy from one region to another.

The amount of energy distributed by federally owned companies as compared with privately owned companies is shown in Fig. 7. About 90 per cent of the total is distributed by the privately owned utility systems. Federal and municipal divide about equally into 5 per cent each. And I remind you again that the municipal systems have been in existence as long as the privately owned.

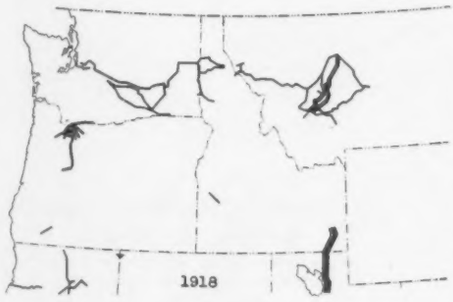
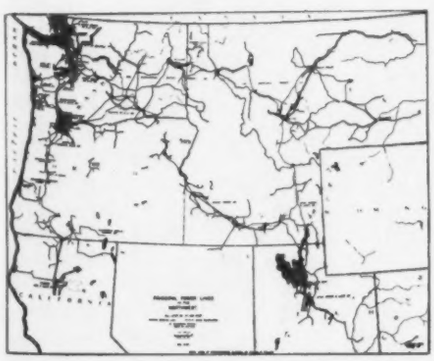


Fig. 8

Fig. 8 reveals the extent of the transmission system of the Pacific Northwest in 1918. You will see at once that it was not very extensive.

Fig. 9 presents the interconnected system of the Pacific Northwest as of 1940. Beginning here with our own company, the Northwestern Electric, we go north to connect with the Puget Sound Power & Light Co.; to the south we connect with the Portland General Electric, and they in turn, with the Mountain States and then on to the California-Oregon Power Co. To the east we connect with the Pacific Power & Light Co., and they in turn connect with the Washington Water Power Co., who connect with the Montana Power Co. Please note the dotted line extending here from Montana to Utah, 260 miles in length, 154,000 volts. This line was energized this spring and will tie together two of our most important Northwest units. Here you will note that Utah is already tied in with the Idaho Power Co. The area served by the Montana, Idaho and Utah companies is most essential in war production, since this is the source of zinc and copper—vital in armament. It happens that Montana Power has the largest installed capacity—342,000 kw. —in a state with a population of only 560,000 people. This is due to the extensive mining and smelting operations which are carried on in this state. Virtually the same is true of Utah, which is a source of copper. As these systems are tied together, it will be possible to exchange power as needed between these important areas.

Fig. 9



In 1937 there was a drought in Montana, and had it not been for the interconnections established by unified and

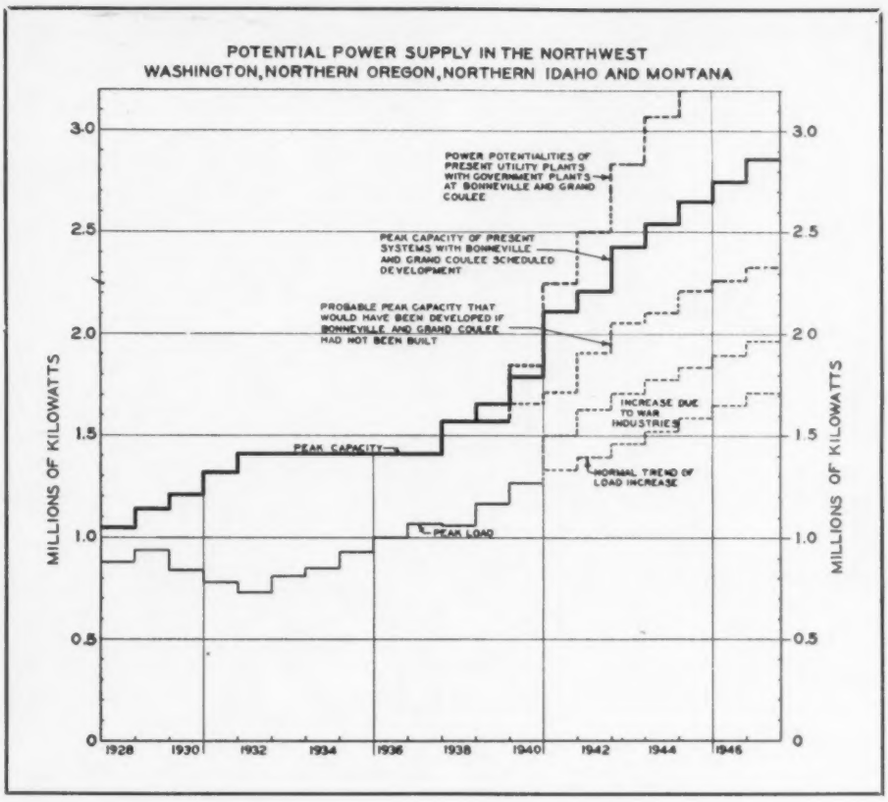


Fig. 10

allied interests, the smelters of Montana would have been forced to close down. Here is what happened. The Montana Power Co. called the Washington Water Power, who normally provide a part of the requirements of Pacific Power & Light. The Washington Water Power Co. called the Pacific company, asking for relief of their obligations to supply them with energy. The Pacific called the Northwestern Electric. The Northwestern started up its Lincoln steam plant, delivered energy into the Pacific system, and they in turn, to the Washington Water Power Co. on a displacement basis, enabling that utility to supply energy as needed by the Montana company. Very little more time was required to complete this job than it has taken me to tell it.

In 1930 you may recall that Tacoma ran short of power. Since they were not interconnected, for the reasons that I gave you previously concerning municipal plants, they were forced to call upon the U. S. Navy, and the airplane carrier Lexington was sent to Tacoma to take care of their requirements. I have often wondered how they would have floated the Lexington to the headwaters of the Missouri River to relieve Montana's need in 1937.

The companies serving the Pacific Northwest have always had faith in this region as one which would one day become a great industrial empire,

due to the natural resources which exist here; and it is with that thought in mind that they have extended their lines until today the number of miles of transmission lines per capita and the installed generating capacity per capita is far in excess of any other economic unit in the entire country.

As indicated by its title Fig. 10 describes the potential power supply in the Northwest in terms of peak capacity and its relation to the peak load from 1928 to 1940 actual and projected to 1948 on the basis of the probable peak capacity that would have been developed if Bonneville and Grand Coulee had not been built; the peak capacity of present systems with Bonneville and Grand Coulee scheduled development; and the power potentialities of present utility plants with government plants at Bonneville and Coulee. An effort has been made to project the normal trend of load increase, and, superimposed with that curve, the increase due to war industries. It is obvious from even a cursory glance at this chart that there has existed a peaking capacity with ample reserve in relation to the peak load as it has occurred to and including 1940, and the projections show that the future to 1948 does not present a possible power shortage unless something quite abnormal occurs.

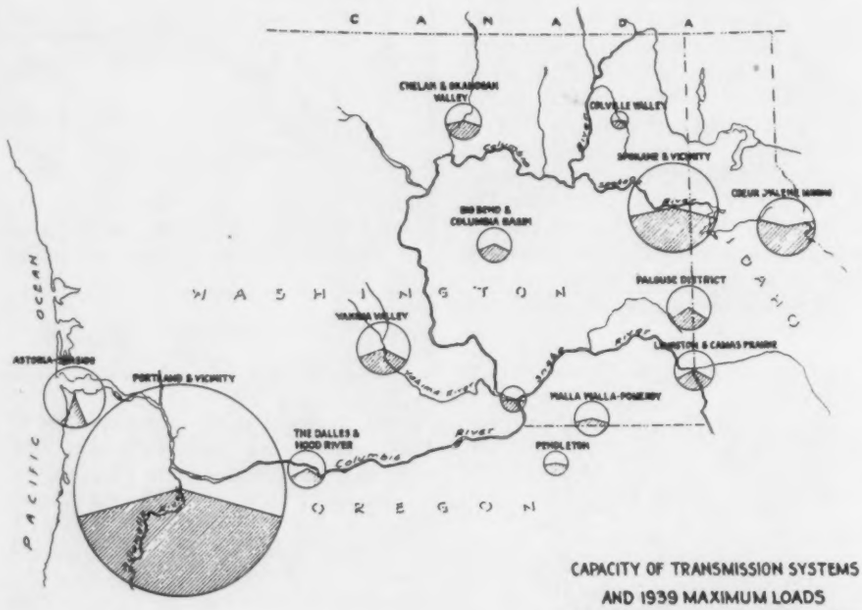
Fig. 11 shows the capacity of transmission systems and 1939 maximum loads based upon coordinated operation of government's present system and present privately owned utility systems. While all areas in the Pacific Northwest have not been analysed in this particular study, sufficient analysis has been made to indicate that there is a reserve of more than 50 per cent of capacity in relationship to load in all vital areas which were included in the study, excepting only the Coeur d'Alene, which shows a little less than 50 per cent reserve capacity.

The Northwest has been essentially an area producing large quantities of raw materials and, as such, we have been a source of great wealth to the nation, but we have not employed the value of these resources to the greatest benefit to ourselves. This has led to an unbalanced economy wherein the number of people employed in service industries exceeds the number employed in the basic industries. Even before Bonneville was finally approved as a government project, the officials of the Northwest companies urged its construction, realizing its economic value in making it possible for the conversion of raw materials here into useful products and the enjoyment of a competitive basis with other producing areas in relation to consuming markets. Our predictions have come true, as you will know from the number of important basic industries that have established themselves in the Columbia area during the past year. Many others will follow.

As I have said before we have, as salesmen, an important responsibility in telling this story; and we must, of course, realize that an individual, company or system fades into insignificance if it is not for the best interests of the largest number of citizens. We have a good story to tell because we have done a good job. I am alarmed at the consequences if these companies are torn limb from limb and the business of interconnection and unification that has been carried on for more than 25 years is destroyed.

In reading of the accounts of air raids on London, and England generally, note the number of references which are made to the efforts of the German bombers to destroy the power systems. The reason is that the destruction of the power plants would immediately destroy the effectiveness of England's armies. Armies can be effective only so long as there is an uninterrupted flow of munitions to them. In a similar sense, don't you suppose Hitler would give a great deal to see the breaking up of our very highly refined system of interconnection; and, particularly, if it were done with the American taxpayers' money. There are men in responsible positions who are unwittingly playing directly into Hitler's hands by suggesting that our system shall be taken away from the present operators and placed in the hands of others.

There is nothing to be gained by such a move with the exception of the change of ownership, if that can, by any stretch of the imagination, be called a gain. The accounts available from numerous sources indicate that the result would lead only to losses financially and to a tragic disturbance in so far as continuity of adequate service is concerned.



CAPACITY OF TRANSMISSION SYSTEMS AND 1939 MAXIMUM LOADS
BASED UPON COORDINATED OPERATION OF GOVERNMENT'S PRESENT SYSTEM AND PRESENT PRIVATELY OWNED UTILITY SYSTEMS

Fig. 11

The problems that lie ahead are serious, but I have faith that the spirit of the American people will overcome them all. There is one thing we have learned—the miracle of our own strength when we stand together. The danger lies in the fact that there may be division in our ranks. I know you share with me the feeling that I have occasionally, that I am wandering around in a fog of futility while the world is crashing about us and we read of values destroyed overnight which represent as much as our own business is worth. And then realize that we seem to be engaged in a sort of internecine war, with government pushing on one side and we on the other. If ever there was a time when America must pull together it is now; and if we are permitted to find expression in an atmosphere of encouragement and if we do definitely all pull together on the same end of the rope, we will, I am sure, make this defense a reality. We will preserve America, not only in name, but in the form in which our founders gave it to us.

Operating Under War Conditions

By E. W. BOWNESS
Canadian Utilities Ltd., Calgary

IF BY "war conditions," you mean sabotage or disruption due to bombing such as is contended with in Britain, then we have, of course, had very little of the former and none of the latter, and as long as the outer citadels such as Britain, Gibraltar, Suez and Singapore hold, that possibility is remote. Should they fall—and I do not for one moment believe they will—then we may be able to tell you something of the power industry under actual war conditions, such as we now hear of from time to time when our men return from Britain. Fourteen employees of our companies who are graduate engineers are on duty in the areas most bombed and we hear from them occasionally.

The war, of course, has meant great industrial development in Canada, particularly in Ontario and Quebec where most of our large manufacturing plants are centered, and are supplied with power from the hydroelectric plants at Niagara Falls, Shawinigan, Beauharnois, etc. The power demand and output of these plants has increased rapidly since the war but the power industry has so far had no difficulty in keeping up with the demand without major development other than the addition of generating capacity at already developed sites. The Ontario Hydro has made contracts with private companies in Quebec and should have ample capacity for 1942. Beauharnois in Quebec is capable of a further increase of 750,000 hp. and another 750,000 hp. under development in Ontario should be available in 1942.

The Prairie Provinces are of course largely agricultural and are not affected as are the more highly industrialized sections. In Alberta, however, we have had some increase in electric output for power purposes principally in Calgary, where one large industry now under construction will require 20,000 hp. and will use about four billion cubic feet of 1100 B.t.u. natural gas per year. The Calgary Power Co. is therefore adding additional generating capacity in its existing hydroelectric plants and developing more storage. The gas companies fortunately have ample line capacity and an almost unlimited supply.

There is one thing which I might refer to at this time which, strictly speaking, may not have much bearing on my subject, but from my observations here I doubt if you fully realize the job you have taken on. You may remember that at the beginning of what the magazine *Time* calls "World War No. 1," Britain and Canada had a slogan "Business As Usual," and that even in 1939 that slogan was faintly heard. That was the complacent, head-in-sand spirit of Munich which left Britain comparatively unarmed to face a nation fully prepared for "all out" war. I would like to impress upon you, that no catch-word could be more foolish or dangerous in a struggle such as we now have on our hands. You have agreed to become "the arsenal of democracy" and we know that anything you start you are going to finish. But we must all realize that industrial Britain is under almost nightly bombing; that the enemy has available almost the total industrial capacity of Continental Europe; that we have lost the French fleet, and the Irish west coast ports; and that we are losing shipping at the rate of 3,000,000 tons per year.

The Skoda Works in Czechoslovakia, for instance, are perhaps the best in the world, at least as far as machine guns and heavy tanks are concerned. Further, there is no doubt that the French plants are now also being used by Germany. Britain, therefore, has abandoned any such foolish policy as "Business As Usual," and I understand that now 75 per cent of her industrial man-hours are engaged in the production of war supplies only.

Canada has not gone so far, but recent government regulations and laws make it difficult to purchase many manufactured articles which we previously looked on as necessities. My old car, for instance, must last for the duration. The result is that factory capacity, labor and power capacity are released for the manufacture of essential war materials. The turnover dislocation from peace to wartime economy is lessened, and when the war is over the change-back to peacetime production will be simplified. We will have less plant and other war manufacturing capacity to abandon and will have built up an accumulated demand for goods now denied us, which should go a long way toward solving the post-war period of idle plants and idle men.

One thing on which I can speak with some first-hand knowledge is the Commonwealth Air Training scheme, on which with your help we very largely base our hope of ultimate victory.

Some sort of Commonwealth or Empire Air Training scheme was under consideration before the war, but in the autumn of 1939, Canada had only about 4,000 men in her air force. When war broke out this Commonwealth Air Training scheme was speeded up as rapidly as possible, but we were then dependent on British planes for training purposes. After the French collapse every available plane was of course needed in Britain, and for a time in 1940 actual training had to be seriously curtailed due to lack of planes. Construction of the necessary buildings and fields was continued, however, and we now have in Canada 83 air training schools with between 40,000 and 50,000 men under training. This summer there will be over $1,000,000,000 invested in this scheme, and it is expected that there will be 75,000 men continuously in training, of which 15,000, excluding ground crews, gunners, air observers, etc., are to be fighting pilots.

The great proportion of our training planes are still wholly or partially of British make, but we are now getting output of the lighter training planes from our own factories, and of bombers from your country. These new planes cost about $40,000.00 each, and it costs about $25,000.00 to train a pilot.

To give you an idea of the magnitude of this scheme may I tell you that in my province, Alberta, with a population of less than 800,000, we have 15 air training schools costing an average of $1,000,000 each, 48 hangars, with a capacity of 20 large bombers each, 37 miles of hard surface runways, 21 miles of emergency runways, and 13,000 trainees. All these schools are fully equipped with utilities, such as electricity, gas, sewers and water, and since much of the work had to be done during winter conditions, you will understand what this has meant to the utility companies concerned, particularly when most of our men of military age with technical training have enlisted. This seems to be an engineers' war.

All of the above, of course, has meant expenditure of money and resultant high taxation, but, in view of what Britain is spending and paying, we in Canada hesitate to stress our relatively small share. Canada, however, is now spending on the war at the rate of $1,500,000,000 a year, which, on a population or national income basis would mean $20,000,000 a year by the United States. England, with a population of 40 million, is spending at the rate of $20,000,000,000 a year, or about 57 per cent of the total national income, and if you wish to do some mental arithmetic, you can calculate the equivalent expenditure in your country either on a basis of population or of national income. I mention this because there has recently been some criticism of Canada's war effort in certain sections of your press and by isolationist senators.

Canada is still carrying on under the

voluntary system of enlistment, one reason being that we have been able to get men faster than we could equip them, and another being the opposition of an important and quite loyal section of our population to what is called "conscription."

My companies, incidentally, have had 61 men enlist under the voluntary system, and as a large proportion of them were engineers and other technical men whom we could least spare, we are operating under handicaps which you, by your methods, wisely will avoid.

Perhaps you will be interested in knowing what our employees are doing in the common effort to win the war, and what our companies are doing for those who enlist. As intimated, our income taxes are high—considerably higher than yours, although less than in Britain. In practically all cases these taxes are deducted from the employees' pay checks and forwarded to the income tax department. With the employees' consent, the company also deducts a national defense tax, pensions, insurance, or in addition to income taxes, there is another 20 per cent of the employees' salaries, which they never see. We pay twice monthly, and in my own case, for instance, practically all of one fortnightly check is forwarded direct to the government.

The company, on its part, has agreed to hold positions open for all men who enlist, and should their army pay be less than they received from the company, the company makes up the difference and either deposits it to the employee's credit or pays it to any dependent he may specify.

Advertising Committee*

Introductory Statement

By J. HARVEY LEACH
Puget Sound Power & Light Co.

ONE of the features of the conference of advertising men during the Business Development Section meeting in Spokane was a general discussion on the merits of various types of general or institutional ads run during 1940 and early 1941 by the member companies. A display of these ads by the several companies was available and the constructive criticism offered by company representatives and agency men present proved to be of great value to all concerned.

Several excellent talks were heard during the more than two day conference, three of which, being offered in written form, are published in the following pages. Ashton B. Collins, creator of Reddy Kilowatt, led off making a plea for simplification of utility advertising into the language and ideas readily comprehended by the masses. Mr. Collins later expounded a similar idea before one of the closing general sessions of the meeting, and extracts from his remarks at that session are printed herein.

The balance of Thursday afternoon and Friday morning of the Advertising Bureau conference were consumed with three very excellent talks (with discussion thereon) which were not presented in written form for publication. K. I. Jack, The Washington Water Power Co., discussed "Advertising to Meet the Public Power Program," and told of many effective methods to use. He advocated that the effect of such advertising be periodically checked throughout a campaign by a public poll conducted by a disinterested agency so that the company could know whether its advertising program was effective or not.

"Advertising and National Defense," was the subject of a talk by M. G. Kennedy, Pacific Power & Light Co., in which Mr. Kennedy described the manner in which his company was bringing before its public the preparedness of the company and the electrical industry to meet the unusual demands facing it by reason of the national defense effort.

What the average consumer thinks of utility advertising was disclosed by Velma Phillips, Dean of the College of Home Economics, Washington State College. Miss Phillips frankly discussed many phases of utility advertising good and bad that had come to her personal knowledge.

Harry R. Burton of McCann-Erickson, Inc., discussed the "Relation of a Utility and its Advertising Agency," taking up many points in which close cooperation was necessary in the planning, preparation and execution of an effective utility advertising campaign.

The other two talks on Friday afternoon, one by Raymond Gray, Eastern Oregon Light & Power Co., and one by Grant Merrill, Strang & Prosser, are printed herein.

Radio in Utility Advertising

By GRANT MERRILL
Strang & Prosser

WHENEVER I think of the birth or advent of radio, I am reminded of the legendary account of the birth of Minerva, Roman goddess of wisdom, who sprang full grown from the head of Jupiter clad in shining armor and singing a song of triumph. Because radio did the same thing, legendary as it might sound; it was full clad in armor and was certainly singing a triumphant song.

Radio is still so new that most of us haven't lost the feeling of wonder at the daily occurrence of instantaneous communication between far-distant points. Radio remains the eternal miracle, but it is none the less the expression, the outgrowth of a very old desire. From earliest times, men have sought to carry on rapid communication with one another. Nearly 500 years before the Christian era, a light-footed runner, Pheidippides, carried the news of the victory of Marathon to the waiting Athenians. Since that time, there is a tale of centuries of human effort to achieve rapid communication.

Since 1898, the wireless telegraph has played its important part in world affairs. The first World War brought about an intensive development of all types of radio apparatus, and wireless became the outstanding method of communication. Radio telephony shared in this development, and before the war ended, an occupant of a plane was able to send spoken messages to an opera-

*J. Harvey Leach, Puget Sound Power & Light Co., chairman. M. G. Kennedy, Pacific Power & Light Co., vice-chairman. B. C. Electric Railway Co.: J. Lightbody; Eastern Oregon Light & Power Co.: Raymond Gray; Idaho Power Co.; Gilbert L. Stanton; The Montana Power Co.; W. P. Dolan; McCann-Erickson, Inc.; H. Burton; Portland General Electric Co.; Ralph Millsap; Strang & Prosser Agency: Grant Merrill; Utah Power & Light Co.: M. L. Cummings; The Washington Water Power Co.: K. I. Jack.

tor on the ground from a height of two miles.

Shortly after the war, 1921, radio sets—the old crystal sets—were manufactured to be sold into the homes, and soon radio broadcasting became a reality. Radio stations sprang up like mushrooms, and before many years, there were hundreds of them throughout the United States and the world. Today, there are 883 in the United States alone. Networks were also started, such as the great systems of the National, Columbia and Mutual Broadcasting Companies.

The question soon arose: How are these radio stations going to make money? In England and other countries, radio was controlled by the government, and the people who owned radio sets were charged a license fee for each set. Here there has never been a fee, and it wasn't long before the stations started "selling time," as it is called in radio parlance, to manufacturers and others desiring to take advantage of the superb advertising facilities of radio.

Such are the beginnings of radio, and such are some of the problems that have arisen in this rapidly growing industry. I have given these facts just to remind you that radio is still in its infancy, and to show you that everything possible is being done to bring you better reception of the programs through modern science's greatest achievement. Moreover, no one can foretell just how far radio will develop.

For years, sponsors were cautious about using the radio as a means of advertising. Today, it is difficult to get "time" on the air. The utility companies were among the first to use radio advertising. They knew that the adaptability of radio to institutional advertising and the desirability of such a contact between a utility and thousands of its customers were apparent. The effectiveness depended upon the efficiency of the radio outlet in reaching a sufficient number of listeners, and upon the reception of the program itself by these listeners. In other words, to choose the right time for the program and the right station.

In advertising, as in other fields, sometimes the most significant discoveries are made by accident. Take for example, the case of the Pacific Gas and Electric Co. in California. Last year, P.G. & E. took over a two-hour program known as the "Evening Concert," which consisted of recorded classical music. The program had run for several weeks previously as a sustaining program and had proved very popular. P.G. & E. decided to take a chance and sponsored the Evening Concert. It has proved to be highly successful. The programs are planned exactly like a symphony series, with a "guest artist" featured on each evening's program. Programs are printed beforehand and distributed among the listeners. These programs are not mailed; they are offered at the offices of P.G. & E. At first, 5,000 programs were printed; within only eight days, the entire 5,000 were exhausted and 5,000 more had to be printed. In other words, 10,000 people took the trouble to call at the offices and ask for a program.

The popularity of the Evening Concert has proved that people still enjoy classical music, especially if it is offered them without being cluttered up with commercials. P.G. & E. interjected only three commercials in the two full hours of entertainment, and these commercials are short and include modern aids to cultural living, which are in keeping with the cultural type of program.

In direct contrast to the Evening Concert of classical music for adults is Utah Power and Light Co.'s radio program for children that has been highly successful. This program, sponsored in Ogden, was designed to reach the low-use customer and to offer free instruction to the under-priviliged child by way of improving talents and the opportunity of radio performance. It is called the Reddy Kilowatt Club. The use of Reddy Kilowatt appealed to the children. There are two broadcasts a week; auditions are held and the programs mapped out somewhat along the style of the amateur broadcasts. At the time of registration, the child is given the Reddy Kilowatt good luck piece, a badge, and a membership card. All children love this sort of thing—trinkets, badges, and so forth. To each performer on the program is given a Reddy Kilowatt souvenir pencil on which is indicated a prize for a good performance. In 1937, the Reddy Kilowatt Club closed for the summer with 2,500 members. During the 1938 season membership gained at the rate of about 100 members a broadcast. The utility company, in addition, publishes "Reddy Kilowatt Club News," which is distributed to more than 8,000 customers.

The Puget Sound Power and Light Co. in Seattle has used radio as a medium of advertising for many years and has found it very satisfactory in the spreading of good-will, and in putting across rate and tax stories and merchandising messages. At the present time, Puget Power sponsors five different types of programs. For the farmers, there are market quotations every morning at seven o'clock interspersed with lively band music—the "wake-you-up" kind. Also, once a week, John Scott, the company's agricultural engineer, gives informal, interesting talks on rural electrification. These talks are made available to the company's customers through its offices.

For the homemakers, Mrs. Edith Rauch, Home Service Director of Puget Power, presents a weekly morning program, which includes music and interesting data on electric cooking, recipes, home decoration, home lighting, and so forth.

The Highlight Hour is a program designed to contribute home entertainment. It is a half hour program that consists of classical and semi-classical music especially arranged for an eleven-piece string ensemble with a guest artist. There is only one commercial in the half hour, and the message is usually only one or two minutes in length. The Highlight Hour has been on the air for four consecutive years.

Monday night, March 31st, the 316th Greater Washington hour was presented by Puget Power. This program, usually conducted by Henry Gille, has done a good job of institutional work, and has instilled in the minds of the listeners a desire to believe in and to help build a greater Washington. Many of the finest speakers and best known men of the state tell the radio audience about the many natural resources, natural scenic beauties, thriving industries that we have in Washington. The talks are supplemented with classical music played by an eleven-piece orchestra. Once in a while there is a very brief mention of Puget Power's work and achievement in the State of Washington; otherwise, there is no commercial.

Last summer, Puget Power changed its policy somewhat in radio advertising and sponsored a special Baseball Mailbag program. For years in the Northwest, Leo Lassen has been broadcasting all the baseball, basketball, and hockey games, and his voice is known to thousands. Because he received so many hundreds of letters about baseball, Leo Lassen decided to answer some of the most interesting ones over the air every night preceding the games. Puget Power sponsored three of these programs a week. Reddy Kilowatt would open the mailbag each evening and find an important institutional message or selling message which would be read by the announcer, then Reddy would tell Leo to go ahead with the baseball letters. The program was closed in somewhat the same manner.

Puget Power, along with many other utility companies, has realized for years that radio advertising does do a good

job, especially when the right kind of program is presented at the right time. The radio is a more personal thing than the newspaper or billboard; therefore, the radio is a good medium for any utility company to use to "air" its problems, tell its merchandising message, and win the good will of the people.

Advertising for New Business

By RAYMOND L. GRAY
Eastern Oregon Light & Power Co.

AMERICAN business is firmly founded on a faith that this year's business should be better than the last, and next year's business, with any luck at all, will be better still. With this faith, and with advertising to help solve our problem of distribution, business can look forward with confidence. We all know that increased distribution of our large supply of electricity through increased sales will automatically lower our rates and put lower priced power within the reach of nearly everyone.

Let us look at our subject, "Advertising for New Business," and see how it applies to our problem of distribution. First, shall we say, for new business in any organization, — "effective advertising of this sort can be of great importance to any company by doing the following":

1. Giving shape and personality to an organization.
2. Building prestige and confidence.
3. Increasing number of users of product.
4. Increasing number of uses of product.
5. Increasing frequency of use.
6. Building up company and its products.
7. Being best news spreader.
8. Aiding dealer relations.
9. Doing artillery work for salesmen.

Now, can advertising in our field of electricity accomplish all of these for us? Yes, I am sure it can.

Just what do we mean when we speak of new business for our various electrical companies? I believe that the term means increase in sale of kilowatt-hours to *existing* customers and sale of kilowatt-hours to *new* customers. Again we say, power companies need only to increase sale of kilowatt-hours to present consumers and obtain new customers in order to make lower rates possible. How can this be accomplished? By advertising electricity in competition with all other commodities such as the automobile, piano, clothing, luxuries, etc., in order to get the most of the consumers' dollar.

Public buying, as we all know, depends on not one element but on four: (1) Means to buy; (2) Confidence to buy; (3) Incentive to buy; and (4) Opportunity to buy.

Lower rates will increase the number of people with means to buy, and well-placed new business advertising will take care of the other three factors.

We have generally accepted that it is becoming increasingly important that we electrical service companies should advertise something besides merchandise in order to give the public this confidence to buy.

What media can we use to get our product before the public, with these four points in view? The same three we use for any advertising: billboard, radio, and newspaper. Billboard or outdoor advertising is the most democratic medium, for it may be seen by virtually everyone and is probably the lowest cost "per impression" medium. How deep these impressions are compared with impressions from other media is, of course, a matter of conjecture, and varies with individual cases. Outdoor advertising is, however, limited to a brief message that usually does not go beyond the use of a four- or five-word phrase and the name of the product.

Radio is as characteristically American today as is the telephone, and nearly as personal. It appeals to the ear—a most receptive channel for appeals to reason or emotion. How often have we heard or said, "If I could only talk to that man." Add to the power of the voice the opportunity of choosing a form of entertainment best suited to the audience you wish to reach, and we see why radio is so well suited to advertising of *services* as well as *products*—to *creating good will* as well as *sales*.

As we know, newspapers carry about three times more advertising than any other one medium in this country. The newspaper permits *local* emphasis in advertising and allows us to reach all classes intensively. If we can gain attention at all, we can reach a larger percentage of population in a given time in this way than we can by any other medium. The newspaper gives us more chance to produce leisurely reading and put our entire story before the public. Newspaper advertising is timely and flexible.

Let us look specifically at newspaper advertising for new business. Advertising of this kind can do much toward correction of those negative public impressions of electrical companies which militate against satisfactory operation and progress. A requirement of such advertising is that it shall correct the negative impressions but without appearing obvious; without appearing defensive; without giving still wider circulation to the impressions it is trying to correct; without being controversial; without appearing smug or boastful; without crying about problems; and without losing sight of the prime objective which should be "make folks like us better and use our product."

It is important that electrical company advertising avoid the appearance of extravagance, and it is therefore necessary to be modest in size of space used. Use of large space creates an impression of extravagance that even a larger expenditure in smaller space at more frequent intervals does not.

Our problem then is to get an audience and tell a story in spite of space limitation and other taboos. Most of our story can be told most effectively by drawing comparisons of the way things once were done and what they cost, with the way they are done and their cost today; by implied contributions of the electric service industry to progress and benefit to the reader.

Currently there is a wide interest in pictures of old costumes, old ways of doing things, old scenes recalling the gay nineties and before. Such pictures are packed with wholesome humor and historical freakishness. Tests we have made prove that they have great attention-attracting power, without the use of larger space or elaborate artistic treatment.

The advertising series we are using at present in our local daily and weekly papers use pictures of that ancient type to gain attention and uses one headline for all ads—"In The Good (?) Old Days." Raising the question of whether those were really "good" compared with the present offers an excuse for telling the electric story. Each ad opens with the question "Were they the good old days?" A note of cheery optimism is left in the mind of the reader with the standard closing sentence — "The Good New Days Are Electrical Days."

During 1940 we tied our radio and newspaper advertising together quite satisfactorily by presenting "Musical Memories" over our local radio station—a program of old tunes woven around the story of Uncle Remus enjoying his family's electrical appliances while reminiscing with old tunes. In early 1941 we have been sponsoring world wide news from United Press.

Let's look at a few of our ads and decide whether or not we have accomplished any of our major objectives of new business advertising.

First, do they convince the public that electricity is cheap, that its cost is

trivial in comparison with other things? Yes. Second, do they induce increased use of electricity by promoting greater appreciation of its comforts and convenience? We are sure they do.

This campaign, we feel, meets the necessity that the advertising of electric companies be: attention-arresting, modest, brief, interesting, constructive, informative, and effective.

Many years ago it was found that the comparative popularity of any series of advertisements could be accurately foretold eight times out of ten in advance of publication, by showing advance proofs to as few as twenty people. The essence of any popular test today is:

1. Actual showing
2. Of fairly finished advertisements
3. To a sufficient group
4. Of fairly representative consumers.

H. B. Hall of Klau-Van Pieterson-Dunlap Associates advertising agency has carried out such a survey of the above campaign in competition with a like campaign planned by a mid-west company. Three cities were selected with respective populations of forty thousand, five thousand, and five hundred. Eight ads were used—four from each company.

These ads were run in the newspapers in the above cities on alternate dates during the month of June, and within a few days after the last ad was run the survey was started and continued through July. The ads were submitted to persons interviewed in a manner intended to give each ad an even break, neither the people making the survey, nor the persons questioned knowing who prepared them. A total of 727 people were interviewed.

Yesterday or Tomorrow

By ASHTON B. COLLINS
Reddy Kilowatt

WE in the Northwest were first in everything except one. We were not, and still are not the first in advertising or politics, whatever you want to call it. We let a handful of politicians come along at the eleventh hour and beat us at our own game. Why? Because we are still talking about ourselves and we are still talking to the upper classes who are mostly with us anyway! Because we are still talking as individual companies and not as the private electrical industry versus public or municipal ownership. The politicians are talking one language while we are talking Tower of Babel languages. They are united. We are not. We can't unite on one single, simple story that the public will get and understand quickly.

Let me remind you of two things. First, the politicians talk to the 51 per cent of your customers who are laborers, foreign born, low-use customers, etc., all voters. They are what is known as the common people or the masses. Second, you talk mainly to the 49 per cent of the people in Rotary, Lions Clubs, etc., and the people you associate with. You still try to tell a truthful, factual, technical story in serious and dignified fashion, and you don't get to first base. They use glittering generalities, catch phrases, slogans and promises about "tomorrow," and they make Home Runs.

It is not accident that it happens that way. In the headquarters of the S.E.C. in Washington, the following appears on the wall for the guidance of their employees: "The kind of writing that takes cognizance of the fact that people have more emotion than logic, more simplicity than subtlety, more inertia than intellect—is the kind of writing that is understood."

Our job today is to take the great, technical, complicated story of our fine business and funnel it down in terms of utmost simplicity and appeal for the masses.

I would like to see this association forget that it was first in ranges, kw.-hr., water heaters, rates and what not, and think that it is in last place in advertising. I would like to see you make advertising the first order of business—be the first electrical group in the country to make advertising the first order of the day.

I would like to see you get the best brains in the association together and all agree on one plan and program, and shoot that same plan day in and day out; lift the whole Northwest Empire electrical industry to the heights and make the rafters ring in language that every man, woman and child in the Northwest can understand, appreciate and like. So that when you stand before the bar of public opinion in any election the answer will be not just, "Well done, thou good and faithful servant in the past 50 years," but "We want what you've got for the next 50 years." Not the story of yesterday, but the promise of tomorrow.

Residential Sales Bureau*

Introductory Statement

By D. J. McGONIGLE
The Montana Power Co.

ON THURSDAY afternoon during the Business Development Section meeting in Spokane the Residential Sales Bureau held a joint conference of its Home Modernization Committee and Home Service Committee. Three of the seven talks delivered are published in the following pages. The other four were not presented in written form for publication. A summary of them follows:

First speaker was Dr. George W. Allison of the Modern Kitchen Bureau on "Why a Sales Department." He stated that although more and more dealers are selling electric equipment, it was still the responsibility of the utility sales department to see that new load goes on the lines, so that all utility sales departments should have a dealer contact department whether the utility is actively selling appliances or not. The utility should coordinate dealer activity and dealer advertising, and assist in carrying out plans and programs including all outlets for electrical appliances so as to get the benefit of massed campaign effort.

Further consideration of coordination with dealers was had through talks by Eric A. Johnston, Columbia Electric & Manufacturing Co., Spokane, and V. J. Morris, a progressive dealer in electric equipment in that city. Mr. Johnston favored having the utility in the merchandising business and encouraged the utility to give fuller cooperation to dealers, particularly through sales training for dealer salesmen. Mr. Morris brought out that excellent results are obtained when tying in dealer advertising with the general advertising of the Inland Empire Electrical Equipment Assn. He also urged utility financing of wiring costs for dealer electric range sales so that the purchaser could pay for this wiring on low monthly payments with his utility service bill.

*D. J. McGonigle, The Montana Power Co., chairman. Chas. E. Hess, Puget Sound Power & Light Co., vice-chairman. Home Modernization Committee, Frank A. Tool, The Washington Water Power Co., chairman; Home Service Committee, W. A. Huckins, Utah Power & Light Co., chairman.

R. O. Kerr, The Montana Power Co., spoke on "Customer Analysis to Develop Profitable Load." In an analysis in his own company it was found that 50 per cent of the customers were using less than 50 kw.-hr. per month, and that among the customers averaging 900 kw.-hr. annually, 90 per cent were actually using only 600. Sales effort is concentrated on customers using less than 50 kw.-hr. and company salesmen are paid a special bonus for the sale of equipment to these users. The first increment of kw.-hr. use among such customers comes on the higher steps of the rates and is thus more profitable to the company.

After this joint session of the two committees on Thursday afternoon, each committee conducted its own conference Friday morning, and resumes of these committee conferences are reported by their respective chairmen, Frank A. Tool for the Home Modernization Committee, and W. A. Huckins for the Home Service Committee.

Home Service and Load Building

By LUCILE RAMIREZ
Washington Water Power Co.

IN discussing the part of the home service department in the load building program, we must first know the objectives of the department. We believe you will find the following objectives representative of the average utility:

1. To make more and better contacts with the public.

2. On every call to fully acquaint customers with the aids to better living available to him through the utility.

3. To analyze service bills emphasizing the cheapness of electric service and the value to customers of increased use of that service.

4. To restore equipment to full use.

5. To make every contact an opportunity to establish in the mind of the customer the value of the company to the customer and the community.

With these objectives in mind we proceed to the preparation of a workable program—a program whose possibilities can be easily understood when presented to the members of the department.

A most important and vital factor is the close supervision which much follow. Many excellent programs have failed due to the lack of close supervision — supervision that knows and understands all the angles of the program and how to cope with them.

We believe that, with the foregoing objectives, a workable program and close supervision plus a department personnel of well trained and enthusiastic advisers, that the home service department can play an important part in the load building program.

Of utmost importance to the utility is the type of call made to the customer of the company and dealer by the home service adviser. This call should involve the company story, the many services the company has to offer, the low rate story and the value of using more company service. It is a call intended to produce a satisfied customer.

Next in importance are training classes. Training is necessary to get the best selling results. Electric cooking and lighting classes should be conducted for dealers and their salesmen. Company salesmen also need training in the advantages and latest features of electric equipment and lighting. They should be trained in its use—for personal experience is an asset in every field.

Utility employes and employes wives who have not been instructed sufficiently in the use of electric equipment should be given this instruction so as to give them a better understanding of the services rendered our customers. We have found that they can be made great boosters for electric equipment and company service. Training classes for service men bring cooperation and understanding in solving the customer's problems and assist him in giving comprehensive answers to questions he may be asked.

The load building possibilities are brought about by conducting talks on lighting, showing films, and giving demonstrations to club groups, such as P.T.A.'s, women's clubs, church and school groups. The latter is where much pressure may be brought to bear for children carry home a story that surpasses anything we can do or say. We have found in our work that projects conducted in the schools reflect great interest in the homes for better lighting. Girl and Boy Scouts win honors in these classes and parents appreciate tremendously the cooperation they receive from the Home Service department.

Load building will be aided by promoting the use of the single filament 300 watt lamps and by giving home service advisers a quota of homes to *completely* light condition.

The home service department can assist load building by conducting cooking demonstrations in schools and colleges. We have found teachers and principals very cooperative and looking to us for assistance in demonstrating to their classes the uses of electric equipment.

Prospect cooking schools, where small groups of husbands and wives may be told the electric equipment story, often result in immediate sales. Larger cooking schools, and newspaper cooking schools from which many prospects are obtained are held where they are deemed advisable.

Restored wattage replaces a lost load. Unused electric equipment frequently stands idle in the home because of necessary repair or for lack of understanding its operation. The home service department has a favorable opportunity to restore to use such equipment as waffle irons, percolators, toasters, ranges, refrigerators, roasters, I.E.S. lamps, and also to replace low wattage bulbs with the proper size.

Our home service department has conducted a restored wattage campaign for two successive years with the result that the first year 185 kw. were restored to use in an eight week period—or the equivalent of 20 electric ranges. The second year a total of 472 kw. or the equivalent of 50 electric ranges were restored during a two-month period. This is too valuable a load to ignore and what easier way is there to rebuild load?

Still another phase of the home service load building program is the promotion of dealer equipment. Due to the fact that dealers are selling a large percentage of electric merchandise, we cannot stress this phase too forcibly. By demonstrating roasters, ironers, ranges, mixers, lighting units, etc., on the dealer's sales floor, conducting cooking schools for his customers, and directing prospects to him, the home service department not only assists the dealer to sell more merchandise but takes a more active part in the load building program.

National surveys show that the majority of homes do not carry either heavy enough wire or have enough convenience outlets to accommodate the electric appliances that make for better living. Therefore, the home service department can do much to assist the promotion of adequate wiring. On her daily calls, the adviser is often able to contact the contractor of a new home while he is still at work and bring to his attention the necessity for adequate wiring. Home Service can be instrumental in promoting adequate wiring demonstrations in home, before clubs, schools or such organizations requesting such demonstrations. Kitchen planning service offers many other opportunities for load building by stressing

to the customer the advantages of a step-saving kitchen equipped with modern equipment.

Load building in 1941 will be benefited by increased employment and more spendable income, by the rapid increase in the marriage rate and the establishment of a large number of new homes; by the increasing appreciation of customer benefits of using more utility services; by the desires to buy new energy using equipment as rapidly as money or credit becomes available and by the plan of electric manufacturers to spend as much or more on appliance advertising and sales promotion in 1941 as they did in 1940.

Responsibility in Customer Relations

By R. B. McELROY
Washington Water Power Co.

WHILE no department has a greater opportunity to improve customer relations than has the new business department, it can only deliver in proportion to the support given by all other departments of the company, no matter how well trained its personnel may be. Customer relations, after all, is an all-company, all-department job. In that connection, too many companies seem to have had the idea that their public relations activities should be limited to a single department functioning for the whole company. That kind of thinking is as obsolete as a model "T" Ford. Customer relations, after all, is the responsibility of every employee from the office boy to the president.

Those in the new business department of the company come in contact with customers more frequently than members of most other departments, however. What our customers think of our company is the sum-total of what they think of the individuals with whom they come in contact, whether it be the meter reader who stepped on a rose bush, or the lineman whose cuss words irritated and disgusted nearby housewives, or the truck driver who cut in ahead of your customer's car and almost caused an accident, or 101 other things and occasions that tend to formulate a good or bad impression regardless of how low our rates are.

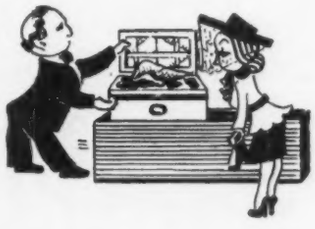
The new business department has a definite responsibility to build better and sounder customer relations: first, by convincing all customers of the constructive nature of the company's influence in the community; second, by encouraging all customers to make the fullest use of the company's service by constantly selling all customers on the value and cheapness of such use. In so doing, the new business department will have made an outstanding contribution to the happiness, comfort and social welfare of all customers.

Today there seems to be every indication that an awakening is taking place and that the electrical industry is coming to realize that it has a selling job to do, which, after all, is a definite function of the new business department. That job, it seems to me, is to give the public an understanding of how the dreams and desires of Mr. Average Citizen become realities under a privately owned and operated company.

To produce a perfect product is no longer enough; we must learn that people are interested in more than just the product and the price—they are interested in how things are done. They are interested in what may be called the social products of business. So you see, we may have to reverse a lot of thinking and overcome a lot of economic misconceptions.

Most people are honest in their beliefs, and if we don't take the trouble to give them the plain facts, which are so abundantly available, then we must not blame them if their reasoning is cockeyed; nor can we blame the politician, who after all is trying to get along in his business just as you and I are trying to get along in ours. So, if we allow a situation to develop and continue that makes it easy for the politician to get elected to office by capitalizing on the voters' ignorance of our service and the contribution it makes to his comfort, then it seems to me that we must admit that the politician is smarter in his line of business than we are in ours.

We do have an outstanding product to sell and the new business department has developed a marvelous sales story about it. It is such a fine sales story that we do not need to exaggerate nor embellish it by one iota. The plain and simple facts are enough, and if we tell our story from the standpoint of its economic and social contribution to the general welfare of all classes of people, we will find that we have an unlimited supply of sales ammunition and promotional material for the job at hand.



We have not place in our sales program for subterfuge or secrecy. We should discuss the facts openly, freely and even proudly. Our industry has all the prime requisites which form a real basis for building and maintaining good customer relations:

1. A product and a service which are vital in meeting modern human needs and in supplying individual and social demands. It is *essentially* right.
2. A service which is rendered in a manner completely adapted to the needs and conveniences of the customer. It is *technically* right.
3. A fair rate schedule constantly diminishing to develop greater use and greater customer satisfaction. It is *economically* right.
4. An organization of human beings constantly working to do a constructive job in the building of society. It is *socially* right.

Our industry is at the front in rendering service to its customers, but not active enough in telling about it—telling our story clearly and convincingly.

The new business department can do much in cultivating customer and community good will, since large national issues rise and grow from community attitudes and prejudices, but as was stated, it is an all-company, all-department responsibility. Working together we can build a sound understanding and appreciation of our service, particularly among the three major interrelated groups in every community.

1. Company employees whose personal contacts and practices directly reflect the management's policy and attitude.
2. Electrical dealers who exert a powerful influence on the thinking of customers and the public at large.
3. Company customers, whose personal attitudes and prejudices affect the company directly, and, on national issues affect the utility industry generally, exert terrific cumulative power.

All this must come about through trained personnel, all of whom have a great many social, as well as business contacts and can exert powerful influence on customers and dealers. But they must know how to represent the company viewpoint intelligently, and how to tell the company's story persuasively and lastly, how to render a superior type of service.

Modernization Committee*

By F. A. TOOL
The Washington Water Power Company

THE CONFERENCE of the Home Modernization Committee Friday morning and part of Friday afternoon at the Spokane meeting of the Business Development Section heard discussed a variety of subjects pertaining to electric service in the home. Most of the talks are published in the following pages, but in addition to those published, the following were also heard.

A. C. McMicken, Portland General Electric Co., on the subject of "Customer Comfort and Profitable Load with Electric Cooking," went into the profitable and unprofitable features of electric range service. It was found that the average electric range returned to the utility approximately $30 per kw.-yr.

"Planting the Seeds for Future Business" was the subject of a talk by Harold A. Halstead of the Spokane Better Housing Bureau. Mr. Halstead brought out how the activities of his Bureau embracing the wide range of home building and home remodeling had increased a demand for all-electric kitchens and other electric home uses of electricity. The activities of this Bureau are explained in more detail in a paper by Mr. Halstead delivered at the meeting of the Home Service Committee and published herein under that heading.

James A. Bell of Electromaster, Inc., talking on the subject "Coming Events Cast Their Shadows Before," presented a comprehensive report on bottled gas. This report was made available to the delegates in mimeographed form, and a number of extra copies are on hand in the office of the executive secretary of the association for those who wish them.

Highlights of this report were that for every three electric ranges sold today, there is one bottled gas range sold. Many claims are made for bottled gas as to its low cost, its safety and its heating speed. In actual tests this is not true and it is not superior to the electric range service. However, its acceptance is constantly increasing and it is becoming a serious competitor of electric range sales. To counteract this competition, Mr. Bell suggested a greater amount of education on the part of the utilities relative to the advantages of the electric range over the bottled gas range.

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The "Tie-In" Bottleneck

By RAYMOND P. KELLEY
Syverson-Kelley Advertising Agency

WITH the utility selling only 10 per cent of the electric appliances in a given territory, the dealers selling 90 per cent, and a vast potential market for these appliances, and people ready to use more and more of our service as the cost of it goes steadily down, we have one of those typical bottlenecks that we hear so much about today. The load we want on our lines can only be had if the appliances using the energy we generate are put in service in the homes, stores, factories and offices, and the sales of these energy-using gadgets under the utility-dealer sales plan must get through the neck of the bottle—and that bottleneck is the cooperation of the dealer.

It is hardly necessary to review the company-dealer set-up. What we are thinking about today is but one phase of that relationship and a very important phase—how can we get the dealer to do more and better tie-in advertising? The big question is: Why, when the utility assumes the responsibility for planning the campaign, pays the cost of the major advertisements, furnishes mats and dealer helps and asks only that the dealer invest a modest amount in an ad of his own to carry the consumer over from the theme of the campaign to the dealer's store—with a substantial part of the dealer's advertising investment recoverable from the manufacturer—why can't we get the dealer to do more and better tie-in advertising? Why does he treat the whole proposition as a favor he is doing the utility or a donation he is making to the advertising medium?

His first reaction is that he can't afford it. But it that the reason, or an alibi? Isn't the real reason that he is not "sold" on advertising? Does he understand advertising as an investment instead of an expense? Does he know what advertising will do and won't do? Does he know how to use advertising to the best advantage? Does he know how to gear his advertising to his sales efforts and to his store displays and all his business building efforts? Does he realize that there are many things he can do to tie in with our efforts that don't call for large outlays of money or that will back up any outlay he makes, even though small?

The answers to these questions must be, if we are realistic, that by and large the dealer does not know these things. Of course, you will find dealers here and there who do, or dealers who have full fledged advertising departments or agencies and are prepared to do a real job. But on the whole, I believe we could get the dealer to do more and better tie-in advertising if he were sold on advertising and knew more about it. It is as important as selling because, after all, it is a part of selling.

The question now becomes: who should do the job of educating the dealer in advertising? For the utility to undertake it means, first, training its own personnel intensively — district managers, local managers and salesmen—in advertising so they in turn can train the dealer. Something has been done along this line by the Washington Water Power Co., but much more could be done.

The newspaper publisher, radio station operator, poster plant and printer have space or time or printer's ink to sell and the better his potential customers understand advertising the more he can sell. Perhaps it is the job of these people. But here is another case where what is everybody's business is nobody's business. And since each medium will naturally try to convince the prospect that his medium is the real McCoy the result may be mostly confusion in the mind of the dealer. There is no overall trade group in the advertising field to do a job like this. Each medium has its own promotion organization, but aside from the Advertising Federation of America and the local advertising clubs, there is no channel for the grass-roots selling of advertising as a business force. The federation has done something along this line in a general way, but it is quite remote from the dealer in our small towns, and of recent years it has been so busy answering attacks on advertising by uplifters that it has had time for little else.

Is this a job the manufacturer can and should do? He has a real and permanent interest in the sale of his product. He is constantly looking for better selling methods. He understands and uses advertising and is set up to get the most out of it. He is already investing large sums in advertising. Why, then,

shouldn't the manufacturer recognize this special problem of the industry and make his own investment in advertising pay bigger returns by carrying the story of advertising out to the dealer? Why not do it as insurance on that part of the dealer's advertising that he is now absorbing? He does a job like that in training the dealer in salesmanship, and I anticipate that he will say he does something to put advertising into the sales picture. But no matter what may be done so far, here is a bottleneck that needs removing and the manufacturer has a real interest in removing it. He is the first to benefit; the utility is the last. Why couldn't he take a part of his advertising appropriation and devote it to this specific job? Personally I think it would do him more good, to make his dealer outlets advertising conscious and advertising-able than to expect some bright young men at desks in New York or Chicago to put his appliances on our lines by turning out glittering color pages in de luxe magazines or cooking up radio network thrillers that may go in one ear and out the other.

How to do the job is something else again. But it is not too tough a problem to lick. It may be that it is a joint job for all to share in. Maybe the utility would have to outline the way to do it, and get the media, the manufacturer, the trade groups and all concerned to join hands in doing it and sharing the expense. However it is done, I firmly believe that the neck of the dealer tie-in bottle can be widened out and more load put on our lines by making advertising a keener, more effective tool in selling appliances, by making the dealer a better advertiser and by showing him how to make the advertising dollar he spends bring him better and more tangible returns.

Customer Comfort Profitable Load

By SAMUEL G. HIBBEN and G. F. HAIN
Westinghouse Lamp Division

UNLESS customer comfort and satisfaction develop from any load-building activity, the results will not be profitable. It may be at once evident that a comfortable customer is a friend and that we do not do a profitable business with our enemies. High-pressure campaigns that don't "stick"—the over-sold or prematurely forced articles—these do not make either pals or profits! The most profitable load is that one which stays sold; it is the one that the customer is convinced gives him full value; it is the one that brings the ultimate comfort primarily to the customer but equally as well to the producer of kilowatts, fixtures, salaries and dividends! All this is so self-evident that it may be a cliché to say that the investment in customer goodwill is not alone the first step but a long part of the journey toward profit.

In each of our 24,000,000 wired residences are 28 to 30 sockets, each of which (except 2.5 empty ones) on the average contains a bulb consuming 46.5 watts. Something in excess of 150,000,000,000 kw.-hr. are annually sold for residence usage and the average per customer meter throughout the country is about 953 kw.-hr. This is an increase of 10 per cent over 1939 and is considerably exceeded in most of the residential areas of the Northwest.

It is difficult to segregate the lighting from the power consumption but it is conservative to estimate that one-half of the residential metered load is for lighting purposes. At least, the residential usage has increased 75 per cent in the past ten years and while wartime economies might tend to slow down this rate of growth, yet on the other hand the increased capacity of electricity to take over household servant problems or to add new comforts in a period of civilization when the comforts we will likely be able to afford must not be expensive luxuries, would tend to keep up this growth rate.

For the first time the average residential rate country-wide is below 4c (actually about 3.8c) and the average residential electric bill is in the neighborhood of $36. Of the 1,000,000 gain in customers last year, 90 per cent were in the residential group.

A further index of the acceptability of residential lighting as a justifiable part of the family budget appears when we note that per capita in this country we consume about eight lamp bulbs annually, whereas our nearest comparable neighbor, Canada, has a consumption of four, and the average for the more civilized countries of the rest of the world is about one. Liberal use of light during leisure hours is an index of comfortable living, of an advancing education and of an elevated civilization.

It has been estimated that residential lighting will practically double in installed lumen capacities in the next decade and although the average wattage per lamp may not increase, yet the hours of its use and the variety of its sub-divisions will increase. While we are surveying the field, it may be interesting to recall that the installed generating capacity in this country exceeds the demand load by about 32 per cent. In 1941-1942 we may expect some 6,715,000 kw. of new generating capacity, an expansion 30 per cent greater than in any previous two-year period.

This means that if and when the industrial demands cease to sky-rocket, and if and when other types of power consumption level off or start to shrink, there will still be the old back-log of residential lighting, a market that can never be neglected and for which a constant educational and promotional program is essential regardless of all other conditions.

Here are some portions of the residential lighting market that we can expect to see developed during the coming decade:

1—The addition, superimposed on the present filament lighting equipment, of a few fluorescent lamps, logically in the kitchen, the bathroom, on porches, over laundry and work places, beneath kitchen cabinets, above the range and for the local lighting of ornaments and pictures. This is not so much a matter of added kilowatts as a matter of added kilowatt-hours because of the longer burning of lamps that are colorful, or cool, or superior economically.

2—The further use of adapter or pin-to-the-wall units in the modernization of old homes and for which already the record speaks for itself. The estimated potential market consists of: 80,000,000 single socket adapters; 160,000,000 adapters and shades for multiple sockets; 70,000,000 adapters for bridge lamps; and 80,000,000 pin-to-the-wall lamps.

3—An additional connected load per residential meter of at least 500 watts of infra-red or drying lamp equipment to bake the rheumatic pains out of sore muscles, or to shine on the person standing before the bathroom mirror on chilly mornings, or to dry the sundry glue and paint jobs at the workbench, or expedite the clothes drying operations on rainy wash-days.

4—A few extra kilowatt-hours from "Sterilamps," or bactericidal units over the kitchen sink, or in the children's bedrooms, or in residential air-conditioning or air-recirculating systems.

5—The growth of luminous ornaments purely for the joy of evening hours. These seem likely to evolve with further developments of translucent plastics, miniature sizes of fluorescent lamps, "black light" sources, and uses of such tools as modified Christmas tree lamps for other seasons and other holidays.

All of these things add to customers' comforts and all represent profitable additional load without additional investment in distribution facilities, or much increase in sales expense except the perpetual job of good-will education.

One of the serious problems we must

face in the coming decade is the one of increasing customer usage of light without too great an investment in the electric consuming device itself. It is for this reason that the lamp bulb is the most potent load builder in the premises of a minimum bill customer because his investment of 15c in a 100-watt Mazda lamp is all that is required to bring to the utility a recurring revenue each month of an equal sum of money.

It is a sacred trust in the hands of all who deal with lighting to continue the educational work lest our world leadership fails in its high ideals. Each succeeding generation on this continent must advance its levels of civilization to the point where the really adequate use of home lighting becomes as unconsciously a part of our modern standards as our demand for adequate food, comfortable heating, or respectable clothing.

The story would not be complete unless in it were included the item of good-will building and the enhancement of comfortable relationships between all representatives of the serving company and all of its residential customers. The best way to build profitable load is to build those personal, local, comfortable relations between supplier and consumer. It is just here that the cultivation of better residential lighting offers the most direct approach to the most people with the most joint power to pay us for a job well done or to condemn us for our neglect of our responsibilities.

Water Heating Opportunities

By EARL A. OLSON
Idaho Power Co.

IF AUTOMATIC electric heating service isn't competitive in price with other methods of heating water, all factors considered, and doesn't offer some plus values of convenience, health, comfort, safety, cleanliness and economy, the customer can't be expected to buy it. On the other hand, if the utility doesn't get a satisfactory rate of return on this business, it can't continue to sell this service at the low rates now in effect.

The customer comforts of automatic electric water heating are as high as on any electric service. The difference between the customer's present method of heating water and the modern electric way is what they are interested in. To the user of a wood or coal heater, automatic electric water heating brings wonderful opportunities.

It is convenient—It does away with shoveling coal and removing ashes. It removes the trouble of building a new fire whenever it goes out. It stops going up and down the basement stairs many times a day to tend the fire.

It is clean—There is no soot, grime and ashes, cuts down on house cleaning tasks. Clean as electric light.

It is dependable—The fire doesn't go out. The water doesn't get too hot or too cold. Right temperature all night as well as all day.

It is safe—No matches and no fumes. An electric water heater can be placed in the children's playroom if that is the convenient place for it. The customer can go away for a two weeks' vacation and know that he will have hot water when he comes back.

It is modern—People wouldn't want to go back to the dangerous, sooty drudgery of old-time lighting. Automatic electric hot water heating brings them the same freedom from the old ways of heating water.

It is cool—Because of its efficiency, the modern electric water heater is the coolest way of heating water. No heat escapes into the room. This is an economy feature also. Heat generated is used to heat the water and nothing else.

It is healthful—The whole family's health is protected with plenty of hot water on tap. You have to have it for cleaning and sterilizing clothes and dishes. Warm baths are very relaxing for tired and aching muscles. Electricity burns up none of the oxygen in the air, is healthful from this angle.

Most of you are familiar with these advantages of modern automatic electric water heating. However, I have repeated them because we in sales must keep foremost in our minds that customers are only interested in what our services will do for them. The benefits are there, we know about them. But do our customers? I know a lot of our own customers don't or we would have more than 25 per cent of them using our service for this purpose. We must at all times be planning and using more effective sales appeals to sell our customers. We know they will benefit by the service.

Now, as to utility benefits of automatic electric water heating service. First, it builds better customer relations. Second, it can be a profitable addition to net revenues.

How does it build better customer relations? I want to read a portion of a letter which was received by a utility to show you what I mean.

"Washing has been much easier, faster and thorough since four years ago when you practically forced me to purchase the new washer by throwing the old one off the back porch. And the mangle, now also four years old, still makes ironing much easier and, as you know, I use my laundry equipment possibly five times as much as the average family.

"The electric stove, now six years old, still works perfectly. And our last purchase, the icebox: it would seem impossible to keep house without it, not mentioning the saving in food costs. And also in relation to the stove and icebox, I must comment on the service that you do not sell, but do include — namely, the home service through Miss ——. This feature really modernizes cooking in the home.

"And so, in expressing my appreciation to you for 'persistently' calling until the sale was made, you have conferred a favor upon the buyer that will be appreciated as time passes."

To what did this lady direct her praise? She directed it toward the equipment she is using and didn't say a thing about the company supplying the service which makes those appliances operate. This letter is typical of the fact that many people, though having lots of praise for the appliances, register loud kicks at the amount of their utility bills. At least this woman doesn't say a word about the amount she is paying for electricity.

Water heating offers us opportunity for selling utility service and its benefits with the effect of having people realize that utility service is cheap; use more of it; and pay for it ungrudgingly. In other words, automatic electric water heating can be one of the best mediums for building customer appreciation of the utility serving them.

Some utility people are not convinced that water heating service is a profitable load. It can be made profitable by promoting its sale in such a way as to improve the company's system-operating characteristics. If a company is to reach a high saturation of water heaters, it will be necessary to keep this service off the peaks by some means of control. When you have a service which can be fitted into the valleys of the load curves, you will have a profitable new load.

Water heating is the only domestic load that can be successfully controlled as to the time of its use. If it weren't for the controllable features of this load, there wouldn't be any reason why we shouldn't charge the same rate we do for cooking, refrigeration, etc. The continued increase in fixed expenses makes it imperative that we not just trade dollars but get paying new business.

Water heating, controlled as to time of use, by the utility can be sold at a

reasonable return because a very considerable portion of the demand feature of cost is done away with, capacity can be used for serving higher paying loads and the improved load factor cuts down on other expenses. Properly designed factory-built water heaters can be disconnected from the line two to four hours per day without impairing hot water service to the customer. Being controlled, it can be made competitive in cost with other methods.

Based on tests made both by trial and error and by study and research over a long period, my company has learned that the type of heater we sell with the top heating unit floating on the line and the bottom unit controlled by carrier current, adds only 50 watts of distribution capacity per heater during the peak period and does not establish an abnormal demand after the off-service interval. We also obtain an exceedingly good water heater load factor of 65.1 per cent. Our charts show us also that during the night valley hours from midnight to 7:00 a.m. a large number of water heating kw.-hr. are supplied.

Another very substantial benefit of automatic electric water heating is the market possibilities to merchandising outlets. In 1941, it offers in the Idaho Power Co. territory alone a market amounting to a quarter of a million dollars. It is merchandise which adds to the profits of dealers and enables them to do a better business. It is a package article which is easily delivered, easily installed and once installed is really forgotten as far as troubles are concerned.

The Enemy Within —Load Mortality

By D. J. McGONIGLE
Montana Power Co.

MY SUBJECT is "The Enemy Within—Load Mortality"—which title implies that within our ranks there is at work a sinister force—a sort of "fifth column." Since load mortality in its broadest sense is revenue mortality, the title might well have been, "Revenue Mortality—the Fifth Column in the Electrical Industry."

Now, just wherein can revenue mortality be likened unto the fifth column? Well, first of all, although it is really with us we are usually quite unconscious of its presence; at least we are inclined to discount its extent. Then again, like the fifth column, it strikes with paralyzing power and with disastrous effects. It is well for us to take a look at this enemy that is constantly gnawing at the vitals of the business.

The term "mortality" as applied to business is not a new use of the word. In the utility business, the term is used in its broadest sense, including the loss of load and revenue from any cause, whether such cause be within the power of the company to prevent or not.

Translating the situation into a few simple questions, one might ask what happens to all the load added to utility lines? Why is it so difficult to reconcile estimated annual revenue, no matter how conservatively estimated, with actual increased earnings? What can be done to insure more continued use of load once it is placed in operation?

Utility financing, today, is a serious problem for management, confronted as it is with increased taxes, higher wages, and numerous other mounting costs. Since rates cannot be raised, because such a move is not only unpopular but also impractical under state regulation, it is apparent that the only opportunity for increased revenues with which to meet the burden of increased costs is through the sale of additional kw.-hr. These do not sell themselves; they must be sold. The federal government erred in this respect in the T.V.A. experiment. The theory it proceeded on was that provided kw.-hr. were made cheap enough, the public would beat a path to the power house door to buy them in quantity. However, the error in this theory was soon apparent, and the government had recourse to doing all of the things that the private utility companies had done for years in the building of load.

Increases in kw.-hr. consumption per customer can only be shown after the losses sustained through load mortality are overcome. As a matter of fact, as we begin each new year of load building, we are somewhat in the position of a baseball batter with one called strike. And let us not think that these losses are negligible. When a good load building job is done, they are naturally absorbed and lost sight of in the final achievement. On the other hand, when the load building job is only mediocre, the losses become more apparent and stand out in bold relief. An incident of this kind occurred on our property in the year 1933 and 1934, when a series of load mortality circumstances combined to decrease the kw.-hr. consumption per customer despite all the sales effort that was done during the year. Therefore, I think it is important first, that we recognize the existence of this sinister force within our business; second that we appreciate that it is a major utility problem and its solution the immediate responsibility of the new business department; third, that we organize and operate so as to keep this loss at a minimum. For then only will a greater average of the sales achievement reflect as added company revenue.

Let us take a look at what happens to load, reviewing the numerous mortality factors that can and often do affect it.

1. Mortality Due to Rate Reductions—The first great factor affecting company revenues, of course, is the rate reduction. Most rate reductions are voluntary. They are desirable, and have been made, and should continue to be made where increased sales effort has developed customer acceptance to the point where the increased use of the service will compensate for the reductions made. The great American pastime of the moment, however, seems to be, through political pressure, to force upon the utilities, rates which are neither justified by the facts, nor sometimes economically feasible. This type of revenue mortality is one over which we exercise little or no control. Nevertheless, it is a form of load mortality that must be overcome if our companies are to survive, and remember it calls for an all-out service selling job to gain it back through greater use.

2. Mortality Due to Current Diversion or Unauthorized Use—Another interesting form of load mortality which helps nullify sales activities is the load on our lines either not properly metered or not metered at all. Proper metering, of course, is a responsibility of operating departments. However, carelessness and indifference make possible the loss of much revenue that should be recorded and billed. I dare say, due to this condition, that all sales departments have sold more load than the kw.-hr. records indicate. Wherefore, a program of proper metering can result in much added revenue to most, if not all, companies. A few years back, there was inaugurated on our property such a program, results of which justified the expense involved. This program called for the installation of non-tamperable meters. In most instances, these new meters were placed on the outside. In one town, chiefly through meter changes, an average increase of 256 kw.-hr. per customer was effected over a three-year period. Outside metering not only makes it difficult for a thief to steal current, but it also makes impossible the innocent connecting of loads ahead of the meter, and we all know instances of both of these kinds of cases.

3. Mortality Due to Increased Operating Efficiencies—With the development of technological research, greater efficiencies are being built into most appliances. Naturally as these appliances of increased efficiency replace obsolete and less efficient appliances,

there is established another form of revenue mortality. However, it is a species of mortality with which I can find little fault. As a matter of fact, I think the industry genuinely welcomes such mortality, because it is worth the price. It enables us to furnish a superior service at less cost to our customers, and after all, the industry does not need to sell any customer more kw.-hr. than he actually needs. There is no need to oversell.

4. Load Mortality Due to Appliances Possessed by Customers But Not in Use—I wonder if anybody has a true conception of the amount of load represented by appliances in the possession of customers, but which for one reason or another, are never used—how many kw.-hr. go begging because of this; how much lost revenue results. I am certain that if it were possible to collect in one place all current consuming devices never used, the accumulated pile would be a shock to the sensibilities of the industry. What to do about it? Kw.-hr. resulting from the use of such appliances, are as valuable as kw.-hr. resulting from the sale of new equipment. Isn't it possible that serious thinking on this situation might resolve itself into a very productive source of revenue?

These unused appliances fall into two classifications. In the first are the appliances which are out of service and are no longer used due to the customer's lack of interest in the appliance's advantages and consequent resulting indifference to its repair or replacement. The other group constitutes appliances in good working order, seldom or possibly never used, due again to a lack of appreciation of customer advantages that were built into the devices. This state of affairs confronts new business departments with a challenge. The condition can be materially corrected by selling customer advantages. When such advantages are well sold, our patrons undoubtedly will follow through and do whatever is necessary to again place this amazing number of units in service.

5. Competing Fuels—Many people look upon the utility business as constituting a monopoly. How erroneous this conception is is apparent when we consider the fact that our service is ever in competition with all other kinds of fuel and power. Unless we are on the alert to meet this competition, this form of revenue mortality can assume serious proportions. I think back to the time on our property when the only competition we had was from coal and wood. Natural gas and oil were undreamed of in Montana. Both of these elements constitute competition to electric load and made serious inroads on much of the business that we had previously built through active sales effort and great financial outlay. Today 80 per cent of our electric customers can buy either natural or manufactured gas; the remaining 20 per cent can buy bottled gas. In our area, and perhaps in yours, oil is a competitive factor. Already we are suffering losses through the loss of some of our electric water heating load to oil. So, therefore, these competing fuels must be lined up as load enemies when we are endeavoring to visualize mortality factors. Here again, in this kind of competition, the sale of advantages of electric services is the most potent defense.

6. Load Mortality That Is Created by the Utility Itself—To me this is a strange situation. On the one hand we look upon load mortality as the enemy in our ranks and on the other hand, we sometimes find ourselves pushing the sale of devices that quickly and materially contribute to load mortality. For instance, I am thinking of the tremendous impetus given the 100-, 200-, 300-watt lamp by the utilities. Perhaps in the early days of Better Light—Better Sight, the variable bulb was necessary in order to soften the impact of raising wattages from 60, 75 and 100 watts to 300 watts. However, today, with general public acceptance of good lighting, isn't it time that we might consider a full transition from the variable to the straight 300-watt bulb in portable lamps? Consider the load mortality in the variable bulb. This lamp, as you know, contains two filaments, one of 100 watts and the other 200 watts. As long as both filaments are whole, I think the total of 300 watts is quite generally used. However, with the burnout of either of these filaments, the general tendency of the customer is to continue the use of the bulb until the other filament is also burned out. This situation reduces the load in use either 33-1/3 per cent or 66-2/3 per cent (depending on which element is burned out) for all of the burning hours left after the disintegration of the first filament. Or figuring it on an average basis, perhaps all these variable 300-watt lamps have been operating at an approximate average of 150 watts, certainly not above an average of 175 watts. Thus, in each of the thousands of these units, the load mortality approximated from 40 to 50 per cent at least a part of the time. I think public acceptance has reached a point where the industry might well consider discarding the variable 300-watt bulb for the straight 300. Let's quit selling load mortality.

There are many things that new business departments, which are charged with the responsibility of preserving old and adding new load, can do about all of these sinister influences, but the greatest of all is to organize and operate on a basis that makes all new business employees, and as a matter of fact all company employees, conscious of their individual responsibilities in aiding the company to hold its load, once secured.

Sales Training—Utilities and Dealers

By J. F. McALLISTER
Utah Power & Light Co.

IN THE ELECTRIC business we are faced with the possibility of scarcity of good salesmen in the near future, because of the defense program which is taking so many of our young men into the various arms of the national service, and the competition from other forms of occupation that are also in need of manpower. Our industry, therefore, must concern itself with developing sales people to carry on electric load building, if we are to continue to increase the use of electricity by all classes of customers. I think we are all agreed that salesmen are not merely born, but rather are developed through training.

Because of the pressure brought to bear against our industry for lower and lower rates, it is imperative that all branches of our industry be analyzed to conserve revenues wherever possible. This can be done through more efficient operation in all departments including sales. One sales authority says, "Part-trained salesmen are part-time salesmen." A salesman putting in full time with only part-time accomplishment cannot be considered efficient or profitable to his employer. Another source advises that 60 to 70 per cent of sales expense is spent for sales manpower. Anything, therefore, which increases the productivity of sales manpower will benefit the total sales program more than any other single item of sales expense.

It has been aptly said that, "Salesmen have been added too often when more volume per man was needed." Sales training is the key to greater productivity and volume per salesman. Greater productivity by the salesman results in overall reduction in sales expense per dollar of new business obtained. This, of course, means more net profit, which is the lifeblood of any business.

Sales training assures continued sound growth in our industry, which in the residential field is anticipated to double present use within the next ten years. The possibilities are tremendous

for salespeople who are properly trained to carry on the sales work to accomplish this goal.

Sales training from our standpoint divides itself into the following classes:

1. Utility
   A—Salesmen.
   B—Non-sales employee.

2. Dealer
   A—Salesmen.

Training of utility employees is the responsibility of the utility itself. The responsibility for trained dealer salesmen remains with the dealer. However, the utility will receive benefits from any dealer training program which makes better dealer salesmen; therefore, the utility should cooperate to help train dealer salesmen wherever possible. This is especially true where the utility does not sell merchandise on its own account.

Training is beneficial to the entire electrical industry and should call for mutual interest and cooperation from the utility, manufacturer, dealer and salesman.

Sales training is so important that a well-planned program should be designed to accomplish the goal or objective of the industry. In this regard a survey of the market is most important, as this will provide an intelligent approach to the job at hand. It will be recognized that the same possibilities for electric service growth in specific fields is not the same in every community. A sales training program then should be designed to capitalize on local possibilities; for instance, training for rural development of electricity will differ somewhat from that designed to expand the urban market.

The training program should also be divided into two parts:

1. Long Range Objective
   A—Retain present business.
   B—Secure new business.
   C—Prepare salesmen for future progress and responsibility.

2. Immediate Objective
   A—Shorten non-productive period of new salesman.
   B—Reduce salesman turnover.
   C—Reduce selling cost.
   D—Increase salesman productivity.
   E—Increase morale.

You will perhaps be interested in knowing how the Utah Power & Light Co. carries out the sales training program in its territory. As you know, the company does not sell major appliances or maintain an outside sales force. The company does sell small table cookery, motor and heating appliances in the company stores located in all parts of territory served.

Dealer contact men and women are employed to contact other employees, dealers and the public to acquaint such groups with benefits available from greater use of electric service. The contact men and women are constantly training employees, dealer salesmen and the public in proper use and operation of all kinds of electric appliances, application of electric rates, policy of the electric utility company, and giving out helpful information which will be of benefit to all those interested in the sale or use of electrical appliances.

At the present time we have ten contact men and twelve contact women who carry on this work. These people come together at various times for specific training conducted by members of general sales staff. In the two large divisions of our company where a group of contact men and women are centered a supervisor carries on a continuous training program.

Training of employees of both utility and dealer is accomplished by meetings conducted by the contact men and women. Sometimes the classes are conducted in company auditoriums and at other times in the dealer stores or offices. A regular schedule is maintained by the contact men and women who report to the general office each week concerning the number and type of meetings held, and the attendance at the meetings.

Other fundamental training is provided for salesmen in company and dealer stores through a cooperative plan sponsored by the Electrical League of Utah and the educational system in our state which operates under the George-Deen Act of Congress which became effective in July of 1937. This act is reported to be in effect in all states of the union and is provided on a cooperative basis by the federal government and the state to give instruction to those engaged in the distributive trades such as selling. The federal government and the state divide the expense with those receiving the instruction, which makes the cost very nominal. The cost to the individual for a 12-class course in salesmanship recently conducted in Salt Lake City was $1.50. This included outline of study and services of one of the best instructors in our part of the country. This type of training can be made continuous so that a salesman may not be required to repeat the basic training time after time but may advance as fast as he is able along related lines. We have had two different classes in training under this plan: (1) Group training; (2) Conference method. The group training was given to beginner salesmen and the conference method employed in training supervisors and managers.

Thus you see how simple our plan is and yet it is so comprehensive that it reaches all classes of people interested in the sales and use of electricity. Since inauguration of this system we have been holding an average of more than 75 group and dealer meetings per month, with an average monthly total attendance of 2,500.

I believe our experience justifies us in saying that sales training is a most important factor in the maintenance of our present business and its future growth as we anticipate it now.

Educating Contractor Aids Adequate Wiring

By J. CARL BALDRIDGE
Idaho Power Co.

THESE remarks are going to be confined to problems of the promotion of adequate wiring in small communities. All of us in the Northwest have the farm customer also. Adequate wiring problems are not any greater, or more acute, on farms than they are in the villages and small towns. Since we are talking about residential business, no account will be taken of commercial, and how we need adequate wiring in the small town business buildings and offices. The potential is literally unlimited. Only about 99 per cent of the homes need heavier copper, more switches, more outlets.

If we are to promote adequate wiring, which is only another way of saying, promote higher wiring standards, then we must: (1) Improve our small town contractor; (2) Give him any help and protection in reason which we are capable of furnishing him.

For a long time we have been expecting a branch of the industry which was often severely criticized by utilities, to carry a load which we should have had a couple of shoulders under also. No industry should have more knowledge of the cost of promotional work and the man-power required to carry it on than the utility industry, when a job like raising wiring standards needs doing. It is not only a needed job, it is a required task if we are to get the increased use of our product—electric power—and the continuing use once it is created. Many contractors were, and still are, under-

financed, not properly trained and perhaps more than anything else, not sales-minded. They know how to install but not how to sell adequate wiring. They lack, and lack seriously, the ability to make their customers and ours see and believe in the advantages adequate wiring will be to them.

We can promote adequate wiring best by showing Mr. and Mrs. Customer that adequate wiring will benefit them. Many who have had experience base their sales talk on: (1) Large enough wire for economy and safety; (2) Enough outlets for convenience and comfort; (3) Employing an experienced, skilled, contracting firm or contractor.

All are essential. But which one of the three is most valuable because of the appeal it makes? Economy is the goal of many home owners; some are sold on hiring first class mechanics. But you will probably agree that convenience and comfort in an installation of wiring in homes—to paraphrase a well known hardware company's slogan—will be remembered and appreciated long after the price is forgotten.

Advertise? Yes! Talk it? Certainly! Practice adequate wiring? You bet! But don't overlook our relatives in the contracting and wiring business. In one of our towns we have a man who keeps books for an irrigation district, is a J. P., a member of the school board, a village trustee, a deacon in the Methodist Church, an ardent Waltonian, the father of a family, for a very nominal sum turns the street lights on, (about a dozen of them) when it gets dark, and off (sometimes) when daylight comes, will train your bird dog pup, does a fairly nifty first base job on the town ball team, and as a side line does a little wiring, usually not so adequate. He still has aspirations of really finding something to make a living at.

Know your wiremen and their problems well enough so that you have a sympathetic attitude toward them. Does he want a reasonable code to work under? Help him get it. He needs it. And then help him get good inspection in his town. Does he appreciate your help and encouragement? Just give him some understanding help and see his quick response.

For the past few years a part of the time I spend earning my pay check, has been spent getting acquainted with the electrical contractors and their men. Don't forget these wiremen. If you will pardon a personal reference, last December when a bunch of them got together in Lewiston, Idaho, to form an Idaho State Electrical Contractors' Association, I was honored by being chosen as their secretary. If my work has not benefited the public, my company, and the electrical contractors, I have fooled them enough to make them believe that I have their problems at heart. A lot of them are my company's friends.

So in preparing your soil for the planting of these adequate wiring seeds don't forget that the contractors and their men are mighty helpful to bring the plants to maturity and to fruitful bearing.

Dealer Profits Mean Utility Load

By C. E. HESS
Puget Sound Power & Light Co.

TO increase his profits a dealer must increase his volume of sales at a fair profit. Increased volume for the electrical dealer means an increase in the number of electrical appliances sold and this, in turn, a greater number of current-consuming devices on the utility's lines. Conversely, the more current-consuming devices operating on utility lines the greater the demand, both by new users and as replacements, for such equipment. This, of course, means more business and profits for the electrical dealer.

Since these statements are true, I think we all agree that it behooves us, as utilities, to promote cooperative programs with the dealer. Here, however, is where a divergence of opinions may exist. What do we mean by cooperation? Webster tells us that cooperation means "The association of a number of persons for their common benefit; collective action in the pursuit of common well being, especially in some industrial or business process."

Keeping this thought before us, we, of Puget Power, were convinced that any program that included only those ideas appealing to the utility, or was based on what the utility would give to dealers, or that did not tend toward increasing mutual understanding of common problems, would fall short of being a truly cooperative program.

In 1931, Puget Power made its first definite dealer cooperative step, for it was in this year that the merchandising of all electrical appliances, with the exception of water heaters, ranges, refrigerators and lamp globes, was discontinued. This move was made because it was then felt that electrical dealers had demonstrated their ability to do a satisfactory job on such appliances. In addition, they were also ready to do a better job of merchandising refrigerators than was the utility, so the sales emphasis on this item was greatly reduced.

In addition to these two steps, more aggressive assistance to the dealers in the sale of electrical equipment was undertaken, outlined as follows:

1. The home service section was enlarged and more and more time and effort was given to the dealer by the home service representative, both in assisting the dealer to keep his sales sold, and in increasing the demand for added residential electrical equipment through the medium of electric range demonstrations in the home, home lighting demonstrations, and lectures on home lighting and home modernization to women's organizations, and in the schools.

2. The activity of the farm electrification section was expanded through more personnel, and these men, through newspaper articles, personal contacts with the farmers, and lectures, increased the demand for electricity on the farm.

3. In 1932, a commercial and industrial section was formed which has 13 representatives in the field. These men promoted through dealers the sale of lighting, cooking, power and heating equipment. Their work has been done through calls on commercial and industrial establishments and through lectures and demonstrations before service clubs and chambers of commerce.

To give some idea of just what these three above-mentioned activities have meant to the electrical dealer, in 1939 the total sales volume of these activities was in excess of $720,000.

Early in 1939 it became apparent that the electrical dealer was now ready to aggressively and profitably promote the sale of electric ranges. This became apparent because dealer range sales were exceeding those of Puget Power's, and because in over 50 per cent of the cases this company's merchandise salesmen were making range sales in direct competition with a bona-fide electrical dealer. In keeping with its promise to the electrical trade in 1931—that as the electrical dealers demonstrated their ability to sell the major appliances aggressively, this company would withdraw from the field—the company made plans to enter into an expanded dealer sales cooperative activity in 1940.

Before this program could become an actuality, keeping in mind the desirability of making this a truly cooperative move, it was necessary to form a definite program and to choose the men who would represent the company to the dealers. The first question to be answered was: "What shall be the aims of a dealer cooperative section?" After much study and investigation, it was decided that such a program should:

1. Add load faster and more economically.

2. Add impetus to customer good will building.

3. Offer a solution to dealer relations.

The next step was to arrive at an outline of procedure to be followed. Puget Power's answer to this was:

1. Obtain a monthly report of dealer merchandise sales so that a record of progress may be established.

2. Give sales training where desired.

3. Give out data on the cost of operation of electrical appliances.

4. Company service policy will be explained.

5. Have sales representatives available for window and floor display assistance where wanted.

6. Promote range programs, roaster, laundry equipment, lighting, and other appliance campaigns.

7. Promote electrified kitchen idea.

8. Home service section will promote home lighting equipment sales.

9. Home service representatives will call on customers buying ranges.

10. Commercial and industrial section will promote commercial lighting and equipment sales.

11. Farm electrification representatives will promote the sale of electrical equipment for use on the farm and in the farm home.

12. Continue the sponsorship of the E. H. F. A. for the use of electrical dealers.

13. Give free connection service on electric ranges.

14. Continue the practice of putting on newspaper cooking schools.

15. The company does not favor: (a) advertising allowances, (b) wiring allowances, (c) premiums, (d) or any other type of subsidy.

Concerning the type of men that should be chosen as dealer sales representatives, it was felt that they:

1. Should have successful field experience.

2. Should be capable of self-supervision.

3. Should be capable of conducting effective meetings.

4. Should be able to gain the confidence of the dealers.

After a thorough study of the foregoing points and of dealer cooperation programs as carried on by other utilities, this company approached its expanded dealer program with certain definite thoughts in mind. These thoughts, which we regard as fundamental, are:

1. Under no circumstances is a dealer sales representative to call on a dealer just to pass the time of day or to collect a report. In every instance the representative must have some definite objective in mind.

2. Under no circumstances is the dealer sales representative to give to the dealer or to the dealer's employees the impression that we know more than they about merchandising, but rather the impression that those things which we have learned are being passed on to them in the hope that, added to their knowledge of merchandising, they might help to increase their sales.

3. That the dealer cooperation section of Puget Power's sales department shall attempt to act as a coordinating agency so that through united action by the electric industry, sales for all may be decidedly increased.

4. Through tying in with national advertising and national promotions, more profits will accrue to the electric dealer.

5. The dealer sales representative is to be open minded. All of us, being human, are bound, through our associations, to favor some one distributor or manufacturer. But under no conditions is it permissible to permit this attitude of mind to be conveyed to any dealer. Our job is to sell the dealer on the idea of the various uses of electricity. When he has been sold on the desirability of handling these items, it is then distinctly up to the distributors to sell him on the particular makes which they represent. Under no circumstances should we ever be in the position of recommending one make over another.

6. The dealer sales representative must not carry tales, either within or without his own organization. One example of this fault might be where two distributors are trying to get the same dealer. The dealer might tell the representative about a concession that one of these distributors has made. Under no circumstances should the representative ever carry this tale to the other distributor.

7. This company is fundamentally opposed to subsidies. We feel that a cooperative program, in order to succeed, must be simply a cooperative program; that it is distinctly up to the company to assist the electrical dealers in their problems, such as displays, sales problems, etc. We do not feel that any good can accrue to anyone through the medium of purchasing business from the dealer.

8. There must be a continuity of calls. This includes planned concentration of calls within a given area and planning calls on each dealer so that each is a continuation of the previous call.

9. Avoid favoritism. Again we come to a pitfall which is common and intensely human. It is perfectly normal and unavoidable that after anyone has spent some time in a district, he is going to find a few dealers who cooperate fully and willingly. On the other hand, there will be a great number of dealers who are either half-hearted in their cooperation or practically impossible to cooperate with. The successful dealer sales representative must ignore this and treat everyone of his dealers alike.

Now a word about cooperative advertising. Is it possible to get the electrical dealer to tie in with the utility in a program of cooperative advertising? The answer to this is an emphatic "Yes."

After talking with representative dealers throughout the territory served by Puget Power, we came to the following conclusions concerning this type of advertising:

1. The number of ads during any one year should be limited to about 1½ per month. We limited ours to 1 per month during 1940.

2. Dealers, definitely, did not want the newspapers to solicit them concerning such advertising. They wanted to see a copy of the utility's ad and then to be left alone to decide whether or not they should run a tie-in ad.

In the past year we adhered strictly to these requirements with results that were astounding. Probably the most outstanding example was the one where a Bremerton, Wash., paper had to run a four-page supplement to accommodate dealer advertising.

Here is a tabulation of the column inches of advertising run by electrical dealers—not including utility advertising—covering electric ranges, water heaters, and refrigerators, in Puget Power's territory during the year just past, not a single inch of which was paid for or underwritten by the company.

Ranges	19,156
Water Heaters	4,820
Refrigerators	30,689

The final proof as to the success or failure of any program lies in the number of sales made. What was the increase in sales of electrical merchandise? Following is a comparison of sales of ranges, refrigerators, and water heaters for 1940 as compared to 1939:

	Water Heaters	Ranges	Refrigerators
1939	973	2,852	10,063
1940	2,739	7,159	21,954
Increase	1,766	4,307	11,891
Percent increase	181+	151+	118+

In conclusion, may I say that we realize these results cover only one year of experience and we are not conceited enough to think we have either the final answer for a completely successful dealer cooperative program in

our own territory or the answer for a dealer cooperative program in territories which differ from ours. We do feel, however, that the fundamentals briefly reviewed in this paper are worthy of study and application where circumstances permit.

Home Service Conference

Report of Home Service Committee*

By W. A. HUCKINS
Utah Power & Light Co.

I AM GLAD to be able to report to you, as chairman of the Home Service Committee, that this year we have enjoyed especially fine meetings. I want to tell you first just what we wanted to get from the meeting. This included:

1. New Tools—new ideas and methods, new materials and points of view on just what can be obtained in cooperation with other home economics programs and activities in our states.

2. Suggestions for more practical and usable ideas in our dealer cooperative activities.

3. New ideas for a more complete and understanding program in better home and kitchen planning and building. In building up the program for this committee, we decided to invite into our meeting people from outside our own utility field, to give us a new slant on our subject—a new point of view for ourselves.

We heard eight guests from various states and federal agencies, and from the business world. We have taken time to discuss their contributions to our program and as a result we feel that we have secured a bigger, broader picture of home service and the complete home economics field.

As a report to this general session I have asked three of the ladies of of our committee to summarize for you what we have been given today in our committee meeting. I am sure you will find this more interesting than if I tried to give it to you myself. The following reported briefly on the subjects indicated.

Edith Rauch, Puget Sound Power & Light Company, summarizing dealer cooperation; Lucile Ramirez, Washington Water Power Company, on better home planning; Dorothy Stewart, The Montana Power, summarizing the discussion of cooperation with other agencies.

(Those reports recorded the fact that the following from outside the ranks of the association had addressed the conference of the Home Service Committee on the subject indicated: J. Croteau, Diamond Ice & Fuel Co., Spokane, on Dealer-Utility Corporation; Paul Heydon, Secretary, Electrical Contractors' Assn., Spokane, on Electricity and Planning for Modern Homes and Kitchens; H. A. Halstead, Manager, Better Housing Bureau, Spokane, on Activities of Better Housing Bureau of Spokane; Mrs. Mary Conrad, Division of Community Service Program. W.P.-A., Seattle; Edna Herrington, Home Economics Instructor, Rogers High School, Spokane, on Home Economics Program in Schools; Esther Pond, Home Economist, State Cooperative Extension, Pullman, on Extension Service Home Management Program; Mrs. Sarah V. Case, Regional Chief of Home Management, F.S.A., Olympia, on Farm Security Administration Home Management Program; and Edmund D. Cummins, U. S. Department of Agriculture, Surplus Marketing Administration, Seattle, on Surplus Marketing Administration Home Economics Program. Only the talk by H. A. Halstead of the Better Housing Bureau of Spokane was offered in written form for printing with these proceedings—Editor.)

Better Housing Bureau of Spokane

By H. A. HALSTEAD
Manager, Spokane Better Housing Bureau

WITH the help and assistance of the construction and industry committee of the Spokane Chamber of Commerce, the Spokane Better Housing Committee came into being in October of 1934. The first job of the committee was to afford an outlet for information pertaining to the Federal Housing Act and its application to this district. Ton upon ton of literature was distributed throughout the city by the committee during the early part of 1934 to help to familiarize people with some of the advantages being offered to them and to encourage them with their building and remodeling problems under a liberalized loan program.

Shortly after the inception of the committee it was found that funds would be available for a housing survey. This fitted in nicely with the type of work the committee wished to encourage. Each time a home owner was contacted during this survey, he was left with a number of booklets dealing with modernizing work and ways of securing loans for this type of work. This helped a great deal to stimulate interest and to encourage home owners to start work which they would have otherwise put off or waited a long time to do.

Over 25,000 homes inside the city limits of Spokane were surveyed, and from this survey a vast reservoir of information was opened up to the building industry. It was possible for them to plan their advertising campaigns to encourage people in certain types of work. For example, it was found that 1,700 homes would have to install some new plumbing. This furnished the plumbing industry with a goal to work toward. The paint industry profited much by this program, as it was found that many thousands of homes would paint if the money were made available. The roofing man came in for his share of the business as did the stoker man, and many other branches of the industry. This survey furnished enough work to keep the building industry and the committee busy through 1935.

Then early in 1936, the committee sponsored a building show with 55 booths being sold for display purposes. This show, which was visited by 10,000 persons, had a very stimulating affect upon the new home building public. Immediately following this show there was a marked increase in building permits.

Early in the spring of 1937, we were able to secure the Federal Housing Administration's "modeltown" display of miniature houses. This display did much to stimulate the new building for 1937.

In June of 1937, in cooperation with the National Lumber Manufacturers Association, the National Lumber Dealers Association and the Federal Housing Administration, the model "B" home was built. This enterprise was opened for display for two weeks and during that time was visited by about 15,000 people. As a direct result of this about 50 of these plans were distributed at the committee's office and over 17 of the houses were built in the city.

In January of 1937, we added the "Step-Saving Kitchen" department to

*W. A. Huckins, Utah Power & Light Co., chairman. B. C. Electric Railway Co.: Jean Mutch; The California Oregon Power Co.: Yvonne Smith; Idaho Power Co.: Margurette Reinhart; The Montana Power Co.: Dorothy Stewart; Northwestern Electric Co.: Mildred Elrod; Pacific Power & Light Co.: George B. Bocarde, Audrey Herington; Portland General Electric Co.: Phoebe Gillam; Puget Sound Power & Light Co.: Ray U. Muffley, Edith T. Rauch; Utah Power & Light Co.: Nancy Finch; The Washington Water Power Co.: Mary Ann Dysart, Lucile Ramirez.

our organization in order to tie in with the national Modern Kitchen Program. This branch of activity at first met with considerable opposition among various persons in the building field, but it was pointed out that the kitchen was one of the most neglected rooms of the homes which were being built. After acquainting many of the members with the actual kitchen installations, they soon fell in line until today kitchen planning has become one of the major activities of the Better Housing Committee.

Requests for kitchen plans come from many sources. Supporting members of the office send in all their prospects, and many home owners come into the office directly for advice. There are two or three procedures followed in getting the information necessary to lay out the kitchen. First, if it is a remodelling job in Spokane, the building consultant is sent out to measure the room to be remodeled and all the equipment now owned and to be used in the kitchen, and to find out what equipment is to be replaced with new, obtaining information on the type, size and manufacturer's name of the new equipment. All of this information is pertinent to the correct planning of the step-saving kitchen.

A second procedure is followed where the kitchen is located in some outlying city or in the country. In this case a kitchen planning sheet is sent to the owner, or the Home Service girl will call upon the prospect and measure the kitchen and send the information to the better housing office.

The third procedure is in the case of a new home. The owner is encouraged to bring his plans into the office. In many cases where the owner is applying for financing either through a bank or for an FHA conditional commitment, the correct arrangement of the kitchen will bring the loan value of the home up over any additional cost which might be added, and in over 50 percent of the cases it has been found that the proper planning of the kitchen will actually save money.

These kitchen plans are drawn on tracing paper and in color and are bound in an attractive cover along with literature and information on step-saving kitchens and the proper storage of food and arrangement of dishes, pans, etc.

The kitchen prospects coming to us from the electrical service company are given to the members; those coming in from members are returned to the member, thus saving any confusion in allocation of prospects.

During 1937, we planned 492 kitchens, in 1938—597, in 1939—835, in 1940—688 and to date this year 134, making a total of 2,746.

During February of 1938, we opened for display what was known as the Reddy Kilowatt house, which we helped to plan and supervise during construction. This house was visited by over 5,500 persons during its eight-day display. This home might be better identified as the one winning the thousand dollar prize in the *Better Homes and Gardens* magazine contest.

In August we sponsored the remodelling job which was known as the "Half and Half" house. This was a very unusual project in that the house was divided in half, one side being left with the old roof and old cornice and old paint, the other side being remodeled on the exterior from the roof to the ground. In the interior each room was divided in half with one half remodeled, the other half being left for contrast. The kitchen was the only room in the house that was completely remodeled; it was the bright spot of the house and created more interest than any other room.

During August of 1939, we sponsored the display of three model homes known as the "Triplet" houses. Only one of these houses was open for inspection of the interior, however. This house was a model of the latest in electrical equipment, wiring and lighting.

In 1940 we added the Adequate Wiring Bureau. Through this department correct layouts for wiring are provided to anyone building or remodeling a residence. In this planning service the correct locations of outlets and switches are planned for the most convenient use. To date this department has planned 322 wiring installations. These plans are drawn on tracing paper showing the electrical work in red and are bound in a folder accompanied by wiring specifications and various sheets giving information on lighting and wiring.

This service works hand in hand with the kitchen planning service, as anyone coming in for kitchen plans is given service on lighting and wiring, and anyone coming in with lighting questions is given service on kitchen planning if needed.

Our adequate wiring service has been received most enthusiastically as it has made places for a large number of electrical appliances which heretofore were needed and wanted, but could not be had because of the lack of planning for future developments.

The lending institutions and others connected with the building industry are now recognizing that two of the most essential items in the home as far as Mrs. Homeowner is concerned are the kitchen and the wiring of the home, because they play the most important roles in the convenience and the enjoyment of the home.

Rural Sales Bureau*

Introductory Statement

By BEN W. FABER
Portland General Electric Co.

THE CONFERENCE of the Rural Sales Bureau at the Spokane meeting of the Business Development Section was divided into three main subjects. On Thursday afternoon, the conference discussed the various farm youth organizations. The work that the Union Pacific Railroad Co. is doing with farm boys and girls in the states through which it operates was described by Joe W. Jarvis, agricultural agent. Mr. Jarvis' paper is printed herein. F. E. Price, Oregon State College, and Hobart Beresford of the University of Idaho, each discussed 4-H Club work in their respective states; while J. A. Guitteau of Olympia, Wash., told of the Smith-Hughes work in Washington. B. P. Hess, manager, Rural Electrification Dept., Westinghouse E. & M. Co., Pittsburgh, described his company's rural electrification contests.

On Friday morning, the time of the conference was given over to a consideration of certain new developments. Among the papers presented that morning, published herein, are one on Hop

*Ben W. Faber, Portland General Electric Co., chairman. K. W. Browning, Utah Power & Light Co., vice-chairman. B. C. Electric Railway Co.: R. H. Gram; Eastern Oregon Light & Power Co.: R. L. Saling; Idaho Power Co.: E. A. Olson; Mountain States Power Co.: C. B. Greenough; Northwestern Electric Co.: K. S. Hood; Pacific Power & Light Co.: C. O. Bunnell; Portland General Electric Co.: L. C. Moore; Puget Sound Power & Light Co.: Harry Arnold, J. C. Scott, C. W. Wildebour.

Irrigation in the Willamette Valley by W. R. Newmyer, Portland General Electric Co.; one on Farm Refrigeration and another on Milk Cooling Studies by June Roberts, Washington State College; and one on the Applications of Light with particular reference to ultra-violet in agriculture, by George M. Boyd, Westinghouse E. & M. Co. Other contributors to this program were John C. Scott, Puget Sound Power & Light Co.; F. E. Price, on Egg Treatment. Mr. Price referred particularly to Oregon State College Station Circular 138, dated Dec. 1940, entitled "Factors Affecting Egg Quality." During this part of the session Mr. Hess discussed types of electric motors for farms.

Friday afternoon, the conference turned its attention to methods of building up the low use customer, several Bureau members participating in round table discussion. The particular problems in this regard, met in the territory of the Eastern Oregon Light & Power Co., were described by Russell L. Saling, whose paper is published herein.

In reporting to the general session Friday afternoon, Messrs. Faber, Newmyer and Saling, with the aid of Marian Werner, put on a skit illustrating how the prospective farm customer might have been treated in the earlier days and how such a prospect would be handled today. Many farm uses of electricity for the benefit of better living conditions and for profit in farm operation were brought out in this skit.

The Union Pacific Works With Youth

By JOE W. JARVIS
Union Pacific Railroad Co.

TO DEVELOP leadership among farm youth and to encourage them to further their education was the inspiration in back of the agricultural scholarship originated by the Union Pacific Railroad in 1921 at the instance of the late President Carl Raymond Gray. In 1939, by resolution of the board of directors, the scholarship was termed the "Carl Raymond Gray Memorial Scholarship."

The scholarship plan is not a superficial one. The winning of one of these competitive awards is a major achievement and one which requires some years of careful study and close application. The annual expenditure for these awards is not an inconsiderable item and incidentally the Union Pacific is the largest single contributor to agriculture through this method in the United States. The expenditure represents the Union Pacific's free will contribution to the cause of education in agriculture and home making in its territory and our satisfaction will be derived from the numbers of our scholarship students who graduate with the degree of Bachelor of Science or who become successful in their chosen field, and in future years may attain through their own work and personal effort the honorary award of Master Farmer.

The scholarship was first started in Nebraska in 1921 and later expanded to all states served by the railroad. It was started in Oregon, Washington and Idaho in 4-H Club work in 1923 and in vocational agricultural work in these states in 1926. In 1940 and 1941, 267 boys and girls from rural communities of the eleven states served by the Union Pacific had the opportunity of attending their State Agricultural College on a Carl Raymond Gray scholarship. Up to October 1, 1940, 208 winners had enrolled.

Since these annual awards were started, 3,743 winners have been named to receive them up to October 1, 1940. In all the states 2,418 schloarships have been claimed. Of these, 1,489 have been 4-H Club members and 929 have been vocational agriculture students from high schools. Of this number, 589 were awarded in Idaho and 370 used; 354 awarded in Washington and 248 used; 328 awarded in Oregon and 197 claimed; and in Montana 14 awarded and 10 claimed.

We find our Union Pacific graduates developing into solid substantial and influential agriculturists in their districts. Many of them are employed in specialized lines of agricultural and related industries. They have even advanced at an early age to positions of responsibility in county and state government and they represent a cross section of the finest type of American citizenship. Records compiled by our railroad in cooperation with state agricultural colleges show that 68 percent of those receiving awards are now engaged in farming or in agricultural work, such as county extension agents, vocational instructors, in various U. S. Department of Agriculture positions, while several are employed by agricultural corporations or private institutions. Many of the young women are now homemakers or home economics teachers.

Our scholarship is offered each year to a vocational agriculture student in high school and to a 4-H Club member in each county served by the railroad. The winner or alternate, the club member or student, must qualify under rules and requirements agreed to by the railroad, State Agricultural College officials, Department of Vocational Agriculture, and Agricultural Extension Service. The awards, which are designated by a local committee in each county, are based 40 percent on supervised practice or project work, 30 percent on scholastic standing and 30 percent on character, interest, qualities of leadership, community and extra-curricular activities. The value of the award is $100, except when the winner elects to take a winter short course in which case the award is $50. The scholarship must be used at the State Agricultural College within a calendar year after the date of graduation. The awards are only applicable to courses in agriculture or home economics.

At livestock shows and county fairs we cooperate with the young showmen and their leaders in helping to carry out their program. We have helped to secure buyers for livestock auction sales sponsored by F.F.A. and 4-H organizations at livestock shows. We have assisted in conducting judging contests, helping the instructors and at times replacing the leader of a judging team who could not accompany the team. Assistance has been given in the class room and in carrying out demonstrations on preventing livestock losses on the farm and in shipping.

In project work, livestock for feeding or breeding purposes and dairy animals have been located for F.F.A. and 4-H Club boys and girls. We have suggested new project crops that offer possibilities of giving a good return when properly managed.

Motion pictures on subjects of interest have been shown and talks given at local F.F.A. chapter and local 4-H club meetings. Banquets given by both organizations are attended. We help with public speaking contests or assist wherever we can when called upon by those in charge.

The members in most juvenile granges that are being organized are made up largely of F.F.A. and 4-H students. We have helped to organize juvenile granges and made many suggestions for their betterment. No other company has the record of working with the farm youth of America as does the Union Pacific railroad.

Men employed by companies who intend to work with farm youth organizations should first become quite familiar with the objects and purposes of the various groups, the distinction between each, the standards set up by each and a thorough understanding of their methods and procedure.

Hop Irrigation

By W. R. NEWMYER
Portland General Electric Co.

NATURE does not provide enough water during the growing season to produce a maximum yield to hops. Rainfall in the Willamette Valley during the growing season for the past five years has ranged from 2.66 to 8.68 in. The average yield of non-irrigated hops in the Willamette Valley runs from 5 bales per acre for the "earlies" to as high as 7 bales for the "lates." A bale weighs 200 lb. When hops were measured by the box, a box was supposed to contain 9 bushels of green hops and weigh 50 lb. At the present time all hops are picked and paid for by the pound, but the nomenclature "box" is still used to designate approximately 50 lb. of green hops. Hops will dry down to from 12 to 14 lb. per box, so approximately 4 lb. of green hops are required per pound of dried hops.

Irrigation has been practiced by some of the hop growers for many years. In all cases this has been a flood or semi-flood type of irrigation. Most of the hop yards are planted on rolling ground so the problem of irrigation was a difficult one. The practice has been to distribute by concrete pipe lines and from them by canvas hose to the high points and then either flood or contour furrow irrigation down the slopes. This method has been unsatisfactory because of too much water in the low places and not enough on the ridges. Also on several types of soil it caused packing and baking.

During the summer of 1940, several growers installed sprinkler systems. Harry Thacker, of Thacker and Williams, runs a 150-acre yard on the west side of the Willamette River at Eola. Most of the soil is of the Newberg, sandy loam type, a very good soil for hops. In the spring of 1940, Mr. Thacker invested approximately $4,000 in pipe, pump, motor and power line. His labor cost to irrigate the 150 acres twice was a little less than $700. His power cost was about $300, or a total of $3.33 per acre per irrigation. The cost of growing the hops was the same as his previous years. The increased picking and drying cost, 10 per cent depreciation on equipment, and 6 per cent interest charges added to the cost of irrigation amounted to approximately $10,350.

The increased return over 1939 was 484 bales. At a price of 25c per pound, his net return due to the irrigation was $13,850.

In addition to this handsome profit were other profitable results. He had much less dying out of plants so his replanting in the spring of 1941 will be less. Also, his cover crop could be planted earlier in the fall and will make a much better growth to be turned under in the spring. These two factors, of course, apply to the other cases which will be cited.

Mr. Thacker used a high-pressure "Wade-Rain" system with the sprinklers mounted above the trellis. He applied about two inches of water per irrigation. He started irrigating on June 2 and finished the second application on July 21. Mr. Thacker made the statement, "If I could not irrigate my yard, I would quit growing hops."

Frank Needham across the river from Mr. Thacker installed concrete pipe lines in the spring of 1928 and flooded his yard that year and in 1929. Increased yields were obtained, but the ground packed and baked so hard that he abandoned irrigation.

In the spring of 1940 he purchased a "Wade-Rain" system and used it to irrigate his yards once; started June 27 and completed the job on July 27, giving the ground about 2½ in. of water. He used a gas engine to pump his water from the river into a concrete pipe line and a tractor-driven pump to pump from the concrete lines into the sprinkler lines. His cost for power and labor was $5.27 per acre per irrigation, nearly $2.00 higher than Thacker's. His labor cost was 73c per acre less than Mr. Thacker's; therefore, the power cost was about $2.67 per acre higher for the internal combustion engines than for the electric motor job.

In 1939 Mr. Needham produced on 130 acres 526 bales and in 1940, 888 bales, an increase of 362 bales, worth $18,100. Deducting from this gross profit picking and drying costs, interest, and depreciation, he had a net increase due to irrigation of about $10,000.

John Morley of Silverton operates several yards. In one 22-acre yard he has 40-year-old hops. In 1939 this yard produced 120 bales. Due to the necessity of a heavy replanting in the spring of 1940, his 1940 crop was estimated at 90 bales. He actually picked 182 bales, an increased gross profit of $3,100 over his 1939 crop, or $4,600 over the estimated 1940 crop.

Mr. Morley used the Ames "Per-O-Rain" system which includes 1,300 ft. of 7-in. main and two laterals each consisting of 350 ft. of 6-in., 350 ft. of 5-in., and 300 ft. of 4-in. pipe. Due to the fact that electric power is not available at some of his yards, Mr. Morley used his 20-hp. tractor to drive the pump. He operated about two hours per setting, applying approximately 3 2/3 in. of water per irrigation. Mr. Morley did not keep cost records but stated that it cost him approximately $1.60 per acre for fuel and labor, but did not include his own and son's labor in moving pipe.

Mr. Morley made the statement that in irrigating, the hops shattered much less when they were dry and also carried a greener, evener color.

One yard which has been flood irrigated since 1928 is that of Robin Day on Mission Bottom. Mr. Day has a shallow well from which he pumps his water by the use of a centrifugal pump and 10-hp. electric motor. The complete system cost him about $3,500 to install. His labor cost is about $1.00 per acre per irrigation and his power cost, about $1.00. Mr. Day states he is getting from 35 to 50 per cent more hops than if he did not irrigate, and that he would also quit growing hops if he could not irrigate them.

Farm Refrigeration

By JUNE ROBERTS
Washington C.R.E.A.

IN THE preservation of food by chilling, the temperature of the product is lowered to a point slightly above freezing, where the bacterial action is greatly lowered. By the freezing method, the temperature of the product is lowered to a point where the bacterial and enzymic action is stopped.

This discussion will be limited to the refrigeration and freezing of foods as a method of preservation.

The Washington C.R.E.A. in 1938 designed and installed a refrigerator with a sharp-freeze box on the ranch of Asa Clark, near Pullman. This unit has been in operation since that time, and according to Mr. Clark, has proved very economical and satisfactory.

The Washington C.R.E.A., cooperating with the Division of Animal Husbandry and the Division of Home Economics, studied the effect of germicidal lamps on the quality of beef having been aged, frozen and stored five months in a locker. It is an established fact that aging of beef greatly improves its quality. However, the aging period is accompanied by loss in weight and mold growth, which is detrimental to the flavor and causes

considerable loss in the value of the product.

Well selected loins were placed in identical refrigerators for aging, one lot being treated by a G-E T-40 germicidal lamp, while the other lot received no treatment. Bacterial and chemical peroxide tests of the fat were made before aging and after aging. The product was then cut, wrapped, and placed in a locker. Samples were taken out each two weeks for cooking and flavor tests by the Division of Home Economics. After the meat was cooked, mechanical tests for toughness and chemical tests for the peroxide value of the fat were made.

At this time the test is not complete, so we do not have all the data. However, tests thus far completed show that the bacteria count of the meat was greatly reduced by the germicidal lamp treatment, and that we were able to prevent mold growth during the 14-day againg period.

It may be of interest that the meat refrigerator in this hotel is equipped with germicidal lamps, and according to the chief chef, he is able to keep prime cuts of meat for six weeks without mold growth at 38 deg. F.

The Washington C.R.E.A., cooperating with the Division of Poultry Husbandry, the Division of Dairy Husbandry and the Division of Home Economics, is carrying on a new and intesting experiment on the wet-cooling of poultry. This new method of poultry refrigeration consists essentially of placing picked birds in cold water and then storing the birds above the cold water in cool, humid conditions. Mr. Williamson, of the Red Raider Poultry Farm, is using this method and states that the quality of the meat and the color or bloom of the bird was greatly improved by the use of this wet method of cooling. He further states that his butchering costs have been reduced 35 per cent, because the birds are much firmer and easier to dress. They have successfully kept birds for nine days in their wet storage cooler.

Our tests have shown that the greater the scalding temperature, the greater the discoloration and the greater the loss in weight while in storage. With White Leghorn broilers at 150 deg. scald, the wet method gave an increase in weight of 3.75 per cent after eighteen hours of storage, while the dry method lost 3.55 per cent during the same storage time.

Flavor tests conducted by the Division of Home Economics show that the flavor of the wet-cooled birds is equal or superior to that of the dry-cooled birds.

Milk Cooling Studies

By JUNE ROBERTS
Washington C.R.E.A.

THE COOLING requirements of the Washington Standard Milk Ordinance are: "Milk must be cooled within one hour after completion of milking to 50 deg. or less and maintained at that average temperature until delivery. If milk is delivered to a plant or receiving station for pasteurization or separation, it must be delivered within two hours after completion of milking or cooled to 50 deg. or less and maintained at that temperature until delivered." For grade B milk, "A temperature requirement for retail raw milk shall be 60 deg. F., and of milk for pasteurization or separation 70 deg. F."

The fundamental purpose of cooling milk is to retard the growth of bacteria. Bacteria growth in milk is a function of time and temperature.

In Kansas, a study was conducted, where it was found of 1,144 graded producers that 24 per cent did not cool their milk, but hauled it to the receiving station or creamery within two hours after milking. Forty per cent used well water for cooling, 12 per cent ice, and 24 per cent mechanical coolers. The mean well-water temperature varied from 56-64 deg., and the mean cost of ice was 29.9c per hundredweight.

In this investigation, a field study was first made on costs and rate of cooling and then a laboratory study was conducted to check the data from the field and to study other factors which did not lend themselves to field study. A new type of dry-box cooler in which the surface cooler is an integral part of the cooling medium tank was used. Brine was circulated through the surface cooler. As soon as the milk was cooled over the surface cooler, it was stored in the dry compartment. Some dairies use a wet-type cooler. This consists essentially of a refrigerating unit with the cooling coils located near the outside of the storage box. Refrigerant is circulated through the cooling coils, building up an ice bank. The cans are then placed in the cooling water, which is agitated by means of a pneumatic agitator or circulator. This method is extensively used for cooling grade B milk, but is not satisfactory for grade A milk, since there is no provision for storing and cooling the bottles and bottled milk.

In the field and laboratory study, temperatures were measured by dairy thermometers, recording thermometers, and by thermocouples.

Tests were made to show the effect of cooling milk with still and with circulated air. Ten-gallon cans were placed in the college dairy cooler, which was held at approximately 42 deg. The rate of cooling is much more rapid with the circulated air than with the still air. It was definitely proven that milk stored in ten-gallon cans cannot be cooled satisfactorily by means of cool air. Many dairy farmers during the winter are tempted to turn off the cooler and set their cans outside. This practice invariably resulted in the milk being rejected at the plant because of high bacteria counts.

Studies also were conducted to show the rate of cooling when using well water. The effect of stirring the water three times was to lower the average temperature about 5 deg., while continuous agitation increased the rate of cooling considerably. These data show that well water having a temperature of 60 deg. can be satisfactorily used for cooling grade B milk.

The effect of agitation on the rate of cooling milk stored in 10-gal. cans showed that it is not necessary to agitate the water to meet grade B requirements, but it is necessary to have agitation to meet grade A cooling requirements. It makes little difference whether the cooling water is circulated or whether the milk is stirred, but either the water or the milk must be stirred to meet grade A cooling requirements.

The method of refrigeration affects the energy consumption and bacteria counts. This study shows that the bacteria count was low with the dry-box coolers, higher with the wet-box coolers, and extremely high when well water was used as a cooling medium. Also that it is possible to produce a very low bacteria count milk when cooling with ice.

Temperature and box constuction affect the energy consumption. Many dairy farmers in the Middle West have built home-made boxes from a variety of materials. It is thought by some that the lowered cost of the home-made box offsets its higher energy consumption. This study shows that the energy requirement is considerably less for the tank having three layers of Celotex insulation. This insulation, however, is not equivalent to most commercial boxes, and the commercial boxes would have a lower heat loss than is shown by this home-made box.

Calculations of the cost of cooling milk by the wet storage, dry storage

and by ice show that the unit cost of cooling milk is least with the wet box, slightly higher with the dry box, and exceptionally high when cooling with ice.

The cost of electrical energy in the State of Washington is approximately half of that in the Middle West, and the cost of equipment is approximately 10 per cent higher than that in the Middle West. Since the energy cost is approximately 50 per cent of the total cost of cooling, the costs in the State of Washington for cooling milk would be approximately 20 per cent less than those shown in Kansas. This study shows the comparative cost of cooling 100 pounds of milk by the various methods and shows that the wet method is the least, while the dry storage and dry walk-in are approximately the same, and that ice is considerably higher than the mechanical methods.

Suggestions for Cooling Milk

Water having a low enough temperature is not generally available during the summer months to make it a satisfactory method for cooling grade A milk. However, where water of 60 deg. or less is available, it might be used to cool grade B milk. When cooling by water, it is desirable to stir the milk two or three times during the first hour. This increases the rate of cooling. Water movement is also important in the rate of cooling. Therefore, it is suggested that a small tank be used for cooling milk, since a small volume of water will have more movement than a larger volume, provided, of course, that the supply is constant.

Ice has been extensively used for cooling milk. The high cost of ice in many areas, with the availability of electricity, the development of mechanical cooler, and lower electric rates have been responsible for the displacement of this method. In areas where labor is cheap and the cost of ice is low, this method may be satisfactorily used. The primary requisite when using ice is to utilize all of its cooling capacity. This means that a storage box of proper size, construction, and insulation should be secured. Water leaving the surface cooler should be used to help cool the bottles and crates. Natural ice or cool water from an outside storage tank may be used in the winter months, thereby lowering the ice consumption.

The increase in the number of mechanical coolers has been rapid. This popularity is due to their low cost, convenience, and efficiency. Most dairymen having once used a mechanical cooler would not go back to using ice, even if the ice were cheaper. A mechanical cooler is a relatively simple machine, but it should be properly installed, adjusted, and maintained, if it is to serve its owner, giving lasting and trouble-free performance. In the selection of this equipment, one should consider the size required, reliability of manufacturer, the insulation of the box, whether it is commercially built or home-made, as well as the total cost and the cost of repairs. When operating a mechanical cooler, it should be adjusted for the desired temperatures. Lower temperatures than needed increase the heat losses, thereby increasing the cost of refrigeration. The electric motor should be properly installed, wired and protected by fuse or circuit breaker. It is always well to give it a periodic inspection.

Summary

1. Cold air was practically worthless to cool milk stored in 10-gal. cans.
2. If water having a temperature of 60 deg. F. or less is available, its use for cooling to meet the temperature requirement of grade B milk was satisfactory, provided that proper methods were used.
3. When using the mechanical wet storage method, the rate of cooling could be markedly increased by agitating the cooling water. Milk was cooled from 94 deg. F. to below 50 deg. in one hour when the cooling water was agitated.
4. When using the mechanical wet storage method, the rate of cooling could be increased considerably by stirring the milk. If both the cooling water and milk were agitated, the milk was cooled from 94 deg. to below 50 deg. F. in 12 to 16 minutes.
5. The average amount of ice used to cool 100 lb. of milk during the months of July and August for four grade A producers was 107 lb., while for four grade B producers, an average of 41.6 lb. of ice was used to cool 100 lb. of milk.
6. The average monthly total cost of cooling milk during July and August, 1939, for four producers meeting grade A requirements with ice refrigeration was computed to be 38 cents per 100 lb.
7. A low bacteria count in milk could be maintained when cooling with ice, if the proper methods were used.
8. When a concrete storage tank was used, the energy consumption was reduced 50 per cent by insulation.
9. Laboratory tests showed that the energy required to keep the wet storage box cool varied from 19.8 to 28.7 per cent of the total energy required at the rated capacity of cooler.
10. The most satisfactory method studied for cooling milk was mechanical refrigeration operated by an electric motor.

Light in Agriculture

By GEORGE M. BOYD
Westinghouse Electric & Manufacturing Co.

FOR A long time it has been recognized, consciously and unconsciously, that the light of the sun enables human beings and animals alike to see, enables everything to grow and destroys many of the enemies of all. In other words, the sun has furnished us light for sight, growth, warmth and destruction.

Research discovered that the light which enables us to see is a portion only of an energy having a common speed characteristic and that the differentiating feature within this energy is wave lengths. This energy is commonly called "radiant energy" or "light." That small portion of it recognizable by the eye is labeled "visible light."

Research has also discovered that within this light of the sun, there is an invisible light of certain shorter and longer wave lengths than the visible light that are necessary and invaluable to human beings and animals alike, and useful to agriculture. The shorter wave lengths of radiant energy found to be of use in agriculture, human and animal welfare are called ultra-violet, the longer wave lengths, infra-red.

The main function of the sun's visible light is to enable the eye to see. There is some data, however, leading to the conclusion that it is necessary for visible light to pass through the eye in order to affect the anterior lobe of the pituitary gland (a portion of the brain), which in turn, has a direct effect upon reproduction, and in the case of poultry, egg production. Infra-red radiation produces warmth. Ultra-violet radiation has the power of killing certain bacteria, destroying mold spores, producing "sunburn" and forming vitamin D.

Visible light seems to be always accompanied by the heat producing infra-red rays. There seems to be no such a thing as cold visible light. Visible light may also be accompanied by the ultra-violet rays, though the earth is a recipient of a great deal of visible radiation which does not contain lethal rays.

Since it has been definitely established that human beings, animals and agriculture for time immemorial have benefited by, and need these three types of radiation, it is the job of the light-

ing engineer and agricultural engineer to obtain and know how to apply these radiations as they may be needed. No longer is light to be applied only for better sight, better work, happier conditions, but for life-extension and growth as well. As one author puts it, the man dealing with light is now "directly meshed with life itself."

Man-Made Light

With the realization of the values of sunlight, science has been striving to imitate and reproduce that light artificially so that it would be subject to call, control and requirement at any time of the day or night.

Practically everyone is familiar with the light sources which produce light for seeing. They can be had to produce all the intensities useable. In the farm home, much yet remains to be done in getting acceptance and use of adequate intensities and quality of light. Only three points need here be emphasized and re-emphasized:

1. Adequate intensities for different tasks and different eyes.
2. Freedom from glare, either direct or reflected. Light may damage and hinder the eyes as well as aid them.
3. Economical use of light by means of proper control.

The need for adequate intensities and proper quality should receive greater attention. Eyes, such as those of farmer folk, accustomed to the intensities of nature, getting the full benefit of nature's provision of an overhanging forehead, eyebrows and eyelashes to protect them from glare and used continuously in long range vision during the daytime, are more subject to damage and fatigue when compelled to work at close vision, under low intensities and with no chance of nature's provisions to protect them from the glare of low hung bare lamp bulbs.

Some of the other uses of light sources producing visible light, other than aid to the human eye in its seeing task, which have been definitely valuable and revenue increasing in agricultural areas, are:

1. Lights lengthen the laying time for poultry, thereby increasing egg production and enabling the farmer to get eggs when wanted.
2. Ruby lights have shown better results in egg production, so reports the Poultry Department of the Western Washington Experiment Station after three years of experimenting with ordinary incandescent and CX lamps.
3. Dim lights throughout the day and night have been found valuable in bringing meat birds raised inside to heavier weights in less time than without. An increased profit definitely realized.
4. Light advances the mating and laying season of turkeys, making it possible for the raiser to take advantage of an earlier, less congested and higher priced market. A large turkey raiser who has thoroughly proved this idea and enjoyed increased revenues states that the light must be more than is just necessary for the turkeys to see; it must be adequate enough for a real irradiation. He uses 1/8 watt per sq. ft., with lamps in reflectors; without reflectors, 1/4 watt per sq. ft.
5. Lights in the brooder houses of turkey poults prevent piling up in corners and consequent mortality.
6. Range lights for turkeys result in better roosting, and prevent stampeding and night flights, which always bring bruised bodies and mortality, losses from dogs, owls, other natural enemies, and thieving by humans. One turkey raiser has found that it is necessary to provide one 150-watt lamp on a reflector mounted 15 ft. high for every 5,000 sq. ft. of range.

Ultra-violet sources can be had that will produce sunburn, form vitamin D and kill bacteria. None, however, have a distinct cutoff. They overlap in their actions. Our concern is with those sources forming vitamin D, killing bacteria and destroying spores.

The most common method employed to generate ultra-violet is to pass electricity between carbons (the open carbon lamps), through tungsten metal (the CX lamps) and the vaporizing of metal by an electric arc discharge. Of all the metals, mercury at present gives the best results and is used almost exclusively. The mercury lamps which have been most commonly used to form vitamin D are the S-1, S-2 and the S-4. The first two are most commonly referred to as the "sunlamps;" the last is the newest member of the family. All produce in addition to the ultra-violet a great amount of visible light. Other lamps of the mercury type also used were the G-1 and G-5. They were low in visible light output, and were referred to as the "glow lamps."

One lamp, though not used for either the formation of vitamin D or bacteria killing, should be mentioned before we leave the group of ultra-violet sources. It is the lamp known as the "black light." It is low in visible light output, as the enveloping glass strains out all but the ultra-violet. Because the source is small, it makes possible a greater and more accurate reflection and direction of the ultra-violet rays. It is being used in the detection of infertile seeds such as wheat, which fluoresce under this very powerful and concentrated ultra-violet impact.

The lamps most commonly used for killing bacteria and destroying spores are the Sterilamps and the germicidal lamps. All enclosing types of ultra-violet lamps must be equipped with a medium designed to transmit ultra-violet rays.

Vitamin D is a generic name for a class of substances possessing the qualities of preventing rickets, calcium deficiency, malformations, poor teeth and other things having a disastrous effect upon general health and growth. This vitamin may be formed by the action of ultra-violet rays falling on the bodies of humans and animals containing certain organic compounds, or may be obtained from cod liver and fish oils. Oils vary in their vitamin D content. Animals and humans, too, vary in their ability to assimilate these oils. The safest and most dependable method, therefore, of forming vitamin D is, as nature has accomplished it, by means of ultra-violet. The needed organic compounds must be present, however, upon which the ultra-violet can act. The most successful poultrymen are using a small amount of oil along with ultra-violet irradiation.

Cod liver and fish oils easily transmit an unsavory taste to the meat of birds raised for the meat market. Poultrymen, therefore, often remove this food several weeks in advance of market time in order to free the meat of the oil taste. If they do not use ultra-violet, rachitic troubles may develop. A large turkey raiser in southwest Washington found, after removing the oil feeds, that the turkeys were developing serious leg weaknesses and rickets. By applying ultra-violet two hours per day for three months the condition was completely cured. A poultry raiser found that his hens in batteries, although fed an adequate amount of cod liver oil, developed pale combs and wattles. Distinct improvement in color was brought about by exposure to ultra-violet.

In addition to the reasons mentioned above for the use of cod liver and fish oils, these oils also supply the equally needed vitamin A. A complete substitution of ultra-violet for these oils is not good practice.

Although we seem to know much about the need of birds for vitamin D, our knowledge of the needs of other animals is very meager. Accurate knowledge and data about horses are sadly lacking; swine need vitamin D but their requirements differ among breeds and within breeds; white pigs are less subject to rickets than colored ones; vitamin D needs for sheep seem to be low but very little is known; little is known about dairy cattle beyond the fact that they must have sunshine or sun-cured hay, or their artificial equiv-

alent, if malformations are to be prevented and milk production maintained.

Despite the large amount of research backed by numerous experiments on many commercial poultry farms to prove that giving birds an ample supply of ultra-violet energy results in many advantages, monetary as well as others, we must face the fact that there is not a wide acceptance of ultra-violet irradiation. It is said that the results are not tangible enough. Does the trouble lie in the sources that have been used? Have the methods and amounts not been right? The consensus seems to be that the CX lamps are not strong enough, nor dependable enough throughout their life, in ultra-violet. The S-1 and S-2 lamps were not rugged enough and were too expensive. The S-4 lamp seems to be the answer.

The Sterilamp and germicidal type of lamps have been definitely proven at Cornell and Ohio State to render the needed service of definitely controlling and preventing contagious bronchitis. Flocks were restored to production in 3 to 5 days. Egg production was quickly resumed, and the usual later loss of life prevented.

In dairy barns these lamps have produced a marked reduction in the number of micro-organisms floating in the air, thereby making possible a higher grade of raw milk. The bacterial count on treated milk vessels was considerably lessened, enhancing milk quality.

It was thought that the spore killing rays of these lamps could be of value in greenhouses. Experiments offer no encouragement as yet. There seem to be conditions surrounding the development of spores and molds in these locations which the lethal rays of these lamps will not reach. A deficiency in the blue end of the spectrum of the lamps which have been used to stimulate plant growth may be filled by fluorescent lamps.

We are informed by those leading in this matter of "Light in Agriculture" that there is a need of scientifically controlled and checked installations throughout the country to create an understanding of the dependability, value and useableness of these lamps in the minds of the average poultryman, particularly in the application of ultra-violet. We are also informed that upon proper representation as to ability and responsibility to follow through, experimental equipment can be gotten.

There are many unsolved and untouched problems in the use and application of radiant energy in the whole sphere of agriculture to challenge the imagination and energy of the agricultural and illuminating engineer interested in farm electrification.

Selling Low-Use Farm Customers

By R. L. SALING
Eastern Oregon Light & Power Co.

IN EASTERN OREGON, where our 882 electrified farms are spread over approximately 1,400 sq. miles of territory, we are vitally concerned with increasing rural load. Because of the comparatively high altitude and short growing season, the methods of farming and crops raised have virtually been the same since that part of eastern Oregon was first settled. The altitude, with its consequent effect upon the climate in which all of our territory lies, and also the ready availability of wood for cooking and heating at reasonable prices, have played no small part in the lower percentage of saturation in electric cooking and water heating load on our rural lines as compared to other utilities operating in the Pacific Northwest. Due to the large number of acreages in the electrified farms served, on which wheat, hay, and livestock are the principal products raised, the customers are widely separated and diversified farming has never been practiced. Power irrigation has never been used in most of our territory. Irrigation in the farming and ranching sections is almost exclusively by gravity.

Because of the above factors and many others, all of our farm customers, except for a very small percentage, would be classed as "low-use customers" if gauged by the standards of other electric companies in the association. We felt that an educational program based upon the profitable use of electricity on the farm was the essential foundation upon which to build our rural load building program.

Lacking adequate customers per mile of line, rural lines in our system were unprofitable and the only way to bring them out of the red was to engage in planned load building activities. To help us with this program, we instigated a dealer cooperative movement. We offered equipment dealers of the territory full cooperation by furnishing them advice and help on the application of electricity, by supplying them with information obtained from the use and study of different kinds of equipment, and by providing them with names of prospects developed through our contact with customers. In return we asked the dealer to furnish us with the names of customers who had inquired about equipment, so that we might help him close sales, and what kind of equipment had been put into service.

We found this union of effort very profitable to the equipment dealers in greater sales of merchandise and to ourselves in increased load, but it was difficult to convince dealers that certain types of farm equipment should be carried in stock to supply the expected demands created by our customer contact activity.

For instance, in 1937 it became apparent that there would be a larger demand for electric brooders. All poultry house supply dealers in the territory were contacted to get them to stock and sell them. Our efforts were not successful, and it was decided that the company should engage in direct selling of brooders in order to convince the dealers of their marketability. We sold them at regular list price and allowed the customers to pay for them over a three-to-six-month period depending upon their ability to pay. All customers were called upon who were considered prospects and as a result a large number of brooders were placed in service. The dealers then became convinced of their popularity and since 1939 the company has discontinued selling them.

Prior to 1938, we conducted an experiment in cold room chicken brooding. A brooder of proven worth was selected. After one of our customers agreed to the demonstration, the brooder was installed. We provided the equipment necessary to allow the customer to make regular checks and records of room temperatures, brooder temperatures, energy consumed, and mortality of the young chicks. The satisfactory results from this, as in other visual experiments, helped us to influence our customers to greater and more profitable use of electric service.

Reluctance of farmers to change their methods of farming has required a lot of pioneering and education on our part. As an example, in 1935 hardly a farmer had his chickens penned up, nor did he give them the benefits of proper poultry house lighting, a regular diet, and houses to make them producers along with the other livestock. A great many of their flocks had the run of several hundred acres, roosted out at night and were used mostly for meat. This practice caused daily egg hunts and a certain amount of diversity in farm life, but was surely not a profitable one. We finally managed to get a few poultry house lighting systems installed and through the cooperation of the customers used them as demonstration show places. Actual cost accounts and results proved properly housed chickens, given adequate light-

ing at regular hours would produce greater profits.

As there are large numbers of beef cattle, hogs and sheep raised within the boundaries of our system, we next turned our attention to feed grinding as a profitable use of electricity. The electric motor is an item of equipment we found to give an exceptionally effective demonstration. An experiment was conducted to determine the actual costs of feed grinding, using a 5-hp. general purpose farm motor and feed grinder. The results of this test showed that as much as 500 per cent could be saved in grinding costs as against some other previous methods. A mimeographed sheet was prepared on the results and mailed to customers we thought would be interested. This resulted in several automatic feed grinders being installed. Not only does this type of grinder reduce milling cost but also labor cost, as the grinder requires no attention except to fill the hopper.

As we have large bands of sheep in eastern Oregon and usually extremely cold weather during January, February and March, which is the lambing season, we undertook to develop a box type lamb brooder. We sought aid from D. E. Richards, superintendent of the Eastern Oregon Livestock Experiment Station at Union, Ore., and received from him valuable help and advice. We constructed a brooder 48 in. long, 28½ in. high, and 28 in. in depth, having a capacity of from six to eight lambs. We used Built-rite Insulite for insulation.

This is the second year the experiment has been conducted with this type brooder, and in operation it is proving successful on prematurely born lambs. Mr. Richards is highly enthused by the small percentage of lambs lost in this brooder, and we of the company are also enthusiastic because of its efficiency, low operating cost, and prospects of future business it may develop.

The farmer has production problems and many others that require careful study before anyone can help him. Therefore, we treat each of our farm customers as a separate and individual business and approach his problems on this basis. Because of this individual treatment, we have developed new business that might have been easily overlooked.

We fully recognized that, by choosing education as the foundation with which to build our rural load, we had embarked on a long-term program of changing customers' habits. The value of our rural load building program is evidenced by the fact that our load increase in 1940 over 1939 was 28 per cent. The new customers added during 1940 accounted for less than 1 per cent of the total gain. It is our belief that by continuing this type of educational program, in which we improve rural living and show the farmer how he can use electricity for greater profits, we will increase our rural load to such an extent that it will shorten the time till our rural lines will be self-supporting.

Commercial, Industrial Sales Bureau*

Introductory Statement

By A. H. GREISSER
Portland General Electric Co.

THE CONFERENCE of the commercial and industrial group at the Spokane meeting of the Business Development Section was divided into three general subjects: fluorescent lighting, commercial cooking and heating, and industrial power. These subjects were discussed in round table manner without the presentation of formal papers. Several bureau members had submitted or brought with them brief notes on the subjects to be discussed. Most of these notes are printed in the following pages. In addition, some of the informal discussions are summarized for publication.

Under the general heading fluorescent lighting the subjects referred to below were taken up. Objective standards in fluorescent lighting were outlined, with C. T. Bakeman, Puget Sound Power & Light Co., as discussion leader. Under this head also, there was a discussion of fixtures and equipment from the standpoint of the Better Light-Better Sight principles. Utility policies as to the Fluer-a-Lier label were aired with A. H. Greisser as discussion leader. Hilbert S. Johnson, Portland General Electric Co., led the discussion on power factor requirements and methods of enforcement, presenting the same material he later presented at the Engineering & Operation Section meeting of the association, as published in the proceedings of that meeting under the program of the Illumination Subcommittee of the Utilization Committee.

In that part of the conference devoted to commercial cooking and heating, the following subjects were discussed: Selling complete electric kitchens to a hotel chain, load diversity on multi-unit electric cooking and heating installations, electric heating design problems. Such material as was offered in written form pertaining to these discussions is printed hereinafter. Electrified sawmills and woodworking plants, arc-welding machine characteristics, and power factor improvement occupied the time of the conference devoted to industrial power problems. Some notes, test data and case histories pertaining to the discussions of these subjects are published herein.

*A. H. Greisser, Portland General Electric Co., chairman. M. R. Lund (deceased), The Washington Water Power Co.; vice-chairman, B. C. Electric Railway Co.: E. E. Walker; The California Oregon Power Co.: D. A. Runyard; Idaho Power Co.: Orland C. Mayer; The Montana Power Co.: R. E. McDonough; Mountain States Power Co.: Harold E. Farris; Northwestern Electric Co.: J. C. Plankinton; Oregon Gas & Electric Co.: E. J. Ludeman; Pacific Power & Light Co.: J. A. Lockhart; Portland General Electric Co.: A. H. Greisser; Puget Sound Power & Light Co.: Chas. T. Bakeman; Utah Power & Light Co.: J. H. Shaw; The Washington Water Power Co.: Ladner V. Ross; West Coast Power Co.: C. A. Comstock.

Standards In Fluorescent Lighting

By C. T. BAKEMAN
Puget Sound Power and Light Co.

INITIAL trends in the use of fluorescent largely tend to discredit the promise of fluorescent and prevent the public from realizing its true and full advantages. These trends are developing a public reaction and distrust to honest claims and real advantages.

The following is a summary of 31 fluorescent lighting installations made during the first part of 1940 in the Puget Sound territory:

	Amount	Percentage
Total connected load reduction (watts)	23,138	47%
Total kw.-hr. per month reduction	5,018	15%
Average Foot-candles—Before	10.7	
After	14.7	

These are typical installations not including the worst or not including the best. In general, there was no improvement in the quality of the lighting on account of the preponderance of bare bulbs. The survey is presented here, not as a condition in one area, but as a phase of lighting generally true throughout the Pacific Northwest. One has only to investigate the average installation in any area, or read the reports of conferences throughout the country to realize the truth and seriousness of this condition.

Realizing the trend of fluorescent installations, we felt that it was our primary duty to organize an all-industry program in the Puget Sound company territory. The program was designed not only to educate our customers as to their need for and the value of improved lighting, but also to secure the wholehearted support of electrical dealers, wiring contractors, architects and other interested agencies engaged in designing installations and in selling lighting equipment. Our program was further directed toward securing "plus" lighting of proper quality and installed in accordance with I.E.S. and Better Light-Better Sight standards.

At a considerable expenditure of time and effort, we prepared a manual entitled "Fluorescent Lighting Objectives" in which were featured the customer benefits from the proper application of fluorescent lighting. This manual is introduced with the statement of the aforementioned survey findings and the complete outline of the company's sales promotion policy on fluorescent. Next, the special features of fluorescent are interpreted into seeing, selling and production advantages.

Through the auspices of the Illuminating Engineering Society, Washington State Chapter, a series of meetings were held, to which dealers, wiring contractors, jobber lighting specialists, and others were invited. At those meetings, every phase of fluorescent lighting objectives and of design standards were discussed. The manual also was made available to schools and other educational media.

Referring to the manual, a graphic comparison of incandescent *vs.* fluorescent was depicted, indicating the high proportionate investment charge against the fluorescent luminaire. The same type of cost comparison in tabular form was made for a typical office lighting installation; for low-use rooms, such as school rooms; and for high-use rooms, such as mercantile establishments.

In introducing fluorescent objectives, we suggested that the attitude of minimums be discarded in favor of thought along the lines of doubling the foot-candles of the ordinary installation as an objective standard. Our manual shows the need for increased illumination in terms of visual effort or eye benefit and of work benefit. It next shows the relatively small proportion of the total cost of doing business chargeable to lighting, heating and water utilities. It then develops the economics of high-level store lighting by showing that if the lighting is doubled there should be a gain of over seven times in the net profit, as compared with the saving in operating cost if fluorescent is installed as a means of reducing lighting costs to one-half the present cost by incandescent. The same comparisons are made for office lighting and industrial lighting. Proof facts were presented on every value quoted. Following the data on objective standards in the manual, we included various design data from I.E.S. and other sources covering fluorescent lighting fixtures of all types and for the principal fields of application.

We have achieved good results from our educational program, for which success can be partly attributable to the fact that the objective standards selected were reasonable and because we have the wholehearted support and cooperation of the lighting industry in our area. It is highly desirable to have an industry-wide program throughout the Pacific Northwest directed toward high objectives for fluorescent lighting installations.

Discussion

WALTER POTTER, G.E. Co., suggested the association tie-in with the G.E. lamp department "50 Foot-Candle Club" plan for general illumination—not less than 50 foot-candles installations.

ORLAND M.YER, Idaho Power Co.,—We need objective standards, because customers were formerly promoting 50 per cent of the minimum standards established.

H. S. JOHNSON, Portland G.E. Co.—Prospects for fluorescent are either: (a) not satisfied with present illumination; or (b) are attempting to cut lighting bill.

CHARLES WEEDIN, Puget Sound P.&L. Co.—In selling a 50-foot-candle office lighting job, we made a comparison of incandescent and fluorescent cost and benefit. The orginal job was 15 foot-candles. We talked in terms of 30 foot-candles at first, then raised the objective to 50-foot-candles. We used a 35-foot-candle bank lighting job as example for inspection by the prospect. The prospect talked to machine operators in the bank and learned of increased personnel efficiency. Heat was the problem in securing 50-foot-candles with incandescent indirect lighting. We discouraged desk lamps. The cost for a 50-foot-candle fluorescent installation was $700 for three small offices.

C. W. BRISSENDEN, Portland G.E. Co., brought out the fact that air conditioning should also come into the picture with high foot-candle loads.

DON RUNYARD, The California Oregon Power Co.—Our company has had considerable success in selling, through local dealers, four-tube, 200-watt fluorescent fixtures to customers in the low use groups. Practically all of the commercial units placed in service are the unshielded type with a total installed fluorescent capacity of 1 to 1.5 watts per sq. ft. of floor space. A check of 100 installations revealed that kw.-hr. usage was up 4 per cent and revenue up 1 per cent as compared with the customer's former incandescent lighting service. To launch this fluorescent fixture sales campaign, meetings were held with all dealers in the territory, and the company's policies and standards of installation and operating procedure were fully explained. The company commercial department does the customer selling job; dealers sell the fixture to the customer, make the installation and receive practically all of the profit. This was a direct sales campaign. Credit of customers was checked carefully by the power company first. Customers are constantly inquiring about fluorescent during regular lamp selling calls by salesmen. On lamp replacements, the company charges the customer the additional cost on a 200-watt lamp that replaces a 100-watt.

WALTER TOLY, Columbia Electric and Manufacturing Co.—A serious problem is presented by competitors who sell a customer a smaller job after first man on the job has tried to sell an adequate lighting installation. For example, a six-tube installation is replaced with a three or four-tube fixture. The answer may be better salesmanship by the first man, proving to the customer that he needs the greater intensity.

Fluer-A-Lier Label Policies

THE following persons participated in this discussion: W. C. Anderson, Electrical Testing Laboratories, N. Y.; A. H. Greisser, Portland General Electric Co., Portland (discussion leader); Geo. Boyd, Westinghouse Electric & Manufacturing Co.; Walter Toly, Columbia Electric & Manufacturing Co., Spokane; Don Runyard, The California Oregon Power Co., Medford; Arthur Detsch, A. W. Detsch Co., Portland; and H. S. Johnson, Portland General Electric Co., Portland. The discussion regarding the Fluer-A-Lier label by these men brought out the following points:

The label represents a test made by the Electrical Testing Laboratories on the various makes of fixtures that were submitted to see if these fixtures passed the required standards set up by a committee. These standards are not quite as high as the I.E.S. would place upon such equipment but in view of the fact

that the fluorescent lamp and fixtures are developing gradually, it was felt that the Fluer-A-Lier standards were high enough to insure the customer adequate protection from unethical manufacturers' equipment. The enforcement of the quality of the products is very carefully policed.

The cost of testing a fixture is about $50, and a great deal of this cost is spent in advertising the Fluer-A-Lier label and good fluorescent products.

One manufacturer felt that the Fluer-A-Lier label was not necessary because of the fact that the standards set up for the Fluer-A-Lier do not quite meet the original I.E.S. standards. This manufacturer felt, because of this fact, that the product which he manufactured was as good or better in quality than those fixtures which had the Fluer-A-Lier label attached.

One manufacturer felt that the Fluer-A-Lier group was too much of a closed organization, and represented a means of cornering the market, and so was not acceptable to the labeling plan.

Utility men who commented on the subject brought out that this label is the only definite means the utility company has of recommending to the customer a fixture having the specifications of a good product; that for the benefit of those manufacturers who have always produced reliable equipment and yet who have not submitted their fixtures for the Fluer-A-Lier label, the utility company might say that these manufacturers have always been reliable in the past, and in all probability their products could be relied upon at present even without the Fluer-A-Lier label.

Summarizing, it was generally agreed by both utility men and manufacturers' agents that the Fluer-A-Lier label was a step in the right direction toward standardization of fluorescent fixtures but that it was not the final answer to the problem of specifications.

Commercial Cooking Load Diversity

By A. H. GREISSER
Portland General Electric Co.

FROM time to time utility company managements have questioned the net profit involved in electric service for heating and cooking loads which are served under relatively low rates. That type of electric business is competitive with gas, oil and solid fuels, and where special electric rates have been designed to the load, the return is ultimately much lower than that for commercial light and power service.

When the Portland General Electric Co. was considering a new and reduced commercial lighting rate early this year, data were requested on the actual diversity between the maximum 30-min. demand and the connected load in multi-unit installations, and also the demand at the time of the system peak, which occurs between the hours of 4 and 6 p.m. some time between November 15 and the following January 15. Accordingly, a number of the larger all-electric cooking, baking and heating installations were tested by the use of graphic watt meters. The result of a few of these tests are shown on the attached tabulation.

Referring to the tabulation, it will be noted that considering the peak demand in the period 4 to 6 p.m., the annual load factors range from 38 per cent to 161 per cent. Since all of the installations tested and those remaining to be checked had more or less regular characteristics of operation on a day to day, month to month basis, it is considered that a composite load curve may be prepared for that day, month or week when the maximum load occurs and also for the so-called "on-peak" period. Such a composite load curve will very reasonably forecast electric heating, cooking and baking load conditions in the winter period when the system peak is experienced.

The fact should be noted that the bottom line of the tabulation shows gross revenues per year per kilowatt of maximum 30-min. demand. These revenues vary from a low of $19 per kw.-yr. to $36.30 per kw.-yr. However, from the standpoint of system on-peak demand, the revenues range from $33.70 to $117.19 per kw.-yr. Furthermore, the lowest, which averaged only $19 per kw. of maximum demand per year, became $117.19 per kw. of the on-peak demand per year.

It is quite apparent from our tests that through somewhat selective sales promotion, very high over-all load factor can be obtained as a composite of the various types of electric cooking and heating installations. For example, the load of a large department store kitchen, where only noon meals are prepared and served can be balanced off with a number of electric bakeries, whose characteristic operation is during the night hours.

Another special advantage of tests of these electric heating loads is that electrical code standards may be revised to permit an allowance for diversity on the loading of the main feeder serving a multi-unit electric cooking or heating installation where many of the elements are on separate thermostatic control. The relatively high cost of running main line circuits and installing switches or disconnecting devices, particularly in underground distribution areas where long runs are involved, has had a deterring effect on installations of heavy duty ranges and bake ovens. While it is always desirable to install maximum wiring capacity, the cost of that wiring has often been out of proportion to the amount of electric service used in restaurants and bakeries.

Table I—Load Study of Non-Inductive Heating, Cooking and Baking

Load Data:	Hotel (Cooking and Baking)	Restaurant (Cooking and Baking)	Newspaper (Heating)	Airline Terminal (Cooking and Baking)	Restaurant (Cooking and Baking)	Department Store (Heating, Cooking and Baking)	Club (Cooking, Baking and Some Small Power)
Total Connected Load (Kw.)	42.8	74.7	330.0	40.4	71.0	181.0	52.4
Max. 30-min. Demand (Kw.)	16.5	21.0	227.0	15.5	25.0	99.0	26.0
Time of 30-min. Demand	1:30 to 2:00 p.m.	11:35 a.m. to 12:05 p.m.	12:15 to 12:45 p.m.	8:00 to 8:30 a.m.	10:40 to 11:10 a.m.	9:45 to 10:15 a.m.	4:50 to 5:20 a.m.
Date of 30-min. Demand	Feb. 28, 1941	March 2, 1941	Feb. 28, 1941	Feb. 1,1941	Nov. 3, 1940	March 7, 1941	March 17, 1941
Total Yearly Kw.-hr.	46,000	71,800	680,360	51,600*	79,720†	225,760	93,520
Kw.-hr. per Yr. per Kw. Max. Demand	2,790	3,420	3,000	3,340	3,190	2,280	3,600
Kw.-hr. per Yr. per Kw. at 100% Annual Load Factor	8,760	8,760	8,760	8,760	8,760	8,760	8,760
% Annual Load Factor	31.8%	39.0%	34.2%	38.0%	36.4%	26.0%	41.1%
"On Peak" Data: (4 p.m. to 6 p.m.)							
Max. 30-min. "On Peak" Dem. (Kw.)	13.8	12.8	142.0	11.5	16.0	16.0	22.4
Kw.-hr. per Yr. per Kw. Max. "On-Peak Demand"	3,330	5,600	4,800	4,480	4,980	14,100	4,180
Kw.-hr. per Yr. per Kw. at 100% Annual Load Factor	8,760	8,760	8,760	8,760	8,760	8,760	8,760
% Annual (On Peak) Load Factor	38.0%	64.0%	54.6%	51.1%	51.9%	161.0%‡	47.6%
Revenue Data							
Total Annual Revenue (From cooking and baking loads only)	$600.00	$742.40	$4,790.16	$490.00*	$806.00†	$1,875.13	$940.00
Revenue per Yr. per Kw. of Max. 30-min. Demand	$36.30	$35.30	$21.10	$31.60	$32.20	$19.00	$36.20

* Three months' billing prorated to 12 months.
† Eleven months' billing prorated to 12 months.
‡ No cooking or baking done from 4 to 6 p.m. Small load from Beauty Parlor is on.

Written Discussion

By E. E. WALKER
B. C. Electric Railway Co.

With reference to load diversity in electric cooking and heating, it might be of interest for you to have on record that we find that large multi-unit cooking and heating installations of, say, 50 to 60 kw. capacity, will have a consumption of about 100 kw.-hr. per kw. connected per month, and this varies little in the different months of the year. Also, in such oads, we find that the diversity is quite high, and our measurements show that the maximum demand is usually between 40 and 45 per cent of the connected load. We have never made any measurements of the demands at the time of system peak.

Industrial Heating Design Don'ts

By DAVID Y. ROBINSON
Portland

DON'T attempt to save a few dollars on heating by installing heaters having the largest number of watts per dollar until you check with the manufacturer and make certain that the higher wattage heaters will stand up under the particular working conditions for which they are being purchased. Heaters are usually priced according to their physical dimensions, and it is often possible to get a heater having a wattage rating several times greater than a heater of the same size at the same price, and there is a tendency to purchase the high wattage heater. However, the manufacturers have designed their heaters with various wattage densities in order to do specific jobs, and it is important to install the particular heater which was designed for the particular job to be done.

Don't fail to clamp strip heaters tightly against the vessel to be heated. Due to the fact that most strip heaters have mounting lugs on the ends, they are frequently mounted against tanks and other pieces of equipment which require external heating merely by means of the mounting tabs on the ends, and this results in short life for the heaters. They should be held tightly against the vessel by means of some type of clamping plate, and the clamping plates should be mounted on 6-in. centers. Do not be afraid of injuring the strip heater by clamping it tightly against the surface. It has already been under several hundred tons pressure during the process of manufacture.

Don't smother enclosed heaters in insulation. If insulation is placed directly in contact with strip, ring or tubular heaters, they will burn out in a short time. Leave an inch of air space between the heaters and the insulation.

Don't fail to insulate, wherever possible. Insulation reduces heat losses as much as 90 per cent, and results in much lower operating cost and more uniform heating.

Don't fail to provide automatic control. One of our best selling points for electric heat is uniformity of product due to accurate control, and there are so many good thermostats on the market at reasonable prices that there is no longer any reason for controlling our heaters by means of a three heat switch or some such inaccurate method of control. Automatic control will pay for itself many times over in current saving.

Don't use heaters having massive construction on jobs requiring close temperature control. The lighter the heater per watt input, the more accurate the control will be. Heaters having large mass per watt, such as strip heaters, will cause an overrun of temperature after the thermostat cuts off the current, due to the large amount of heat which has been stored up in the heater. Consequently, there will be a corresponding lag in response to the thermostat after the current is aagin turned on, as the large mass of the heater will have to be reheated before most of the heat is transferred to the product. For close temperature control, use tubular type heaters.

Don't use the wrong sheath material on the heaters. All leading manufacturers of heaters make them in various sheaths to withstand any operating condition. For example, do not use copper sheathed immersion heaters in oil. The sulphur which is present in all oil will attack the sheath. For this purpose, use steel sheathed immersion heaters. Manufacturers have compiled lists of materials that might be heated, with recommendations for the proper sheathing of the heaters.

Don't fail to provide an automatic safety cutout on forced convection heaters. Practically all fan type heaters use heating elements of such high wattage density that they will overheat and burn out if the fan fails to provide a stream of air to carry away the heat. There are a number of thermostatic cutouts available which will automatically shut off the heaters if the fan fails for any reason. This precaution will save heating elements and prevent fires.

Don't fail to take into consideration all three of the factors that determine the amount of heat to be installed on a job: (1) radiation losses; (2) heat absorbed by the material to be heated; and (3) heat-up time allowable from a cold start. It is frequently possible to carry on a job of process heating with very few kilowatts installed, but on many such jobs the time that can be allowed to bring the equipment up to operating temperature from cold is short, and it may be necessary to install considerable extra capacity in order to satisfy this demand for a short heat up period.

Electrified Sawmills

By E. E. WALKER
B. C. Electric Railway Co.

WITH regard to the use of compressed air in the local sawmill which was illustrated in "*Electrified Industry,*" the following information may be of interest. In electrically operated sawmills in this territory, the log carriage, which must be reversed frequently, is ordinarily driven from friction pulleys, and this is satisfactory in small mills where the speed of the carriage is low. However, as production is speeded up it is necessary to increase the speed of the carriage and the duty on the friction pulleys becomes so severe that maintenance of the pulley facings becomes a large item of expenditure, in addition to the time lost and labor involved in shutting down the mill while replacements are made. When mills begin to have a production of about 4,000 board feet per hour, this problem becomes serious, and direct maintenance costs up to $100 per month are charged against this item. Operators usually consider a steam engine for this drive, as it is well adapted to this particular operation, and when they have gone to the expense of installing boilers and hiring the necessary engineers to operate them, it is a simple step to install additional steam engines to replace motors and cut down the amount of their power account, as no additional labor may be involved.

In one instance recently we forestalled such a procedure by selling the customer on the idea of using compressed air to operate a reversing air engine in place of a steam engine, the compressed air being supplied from a compressor operated by a 75-hp. motor. As a result of this the total electrical consumption at the mill has increased from 28,000 to 32,000 kw.-hr. per month. While the compressor itself used approximately 8,000 kw.-hr. per month, there is less use of the headsaw motor from which the friction pulleys were previously driven. Also, the capacity of the mill has been increased by 10 or 15 per cent, and the customer maintains that the kilowatt-hours per

Table I—Test of a Transformer-Type Welder

Test Number	1	2	3	4	5	6	7	8
Welding Rod (in.)	3/32	1/8	1/8	1/8	Carbon Torch	Carbon Torch	Carbon Torch	Carbon Torch
Welder Tap	75	100	130	150	75	100	130	150
Welder Primary (Amp.)	30	30	29.6	28	31.2	30	30.7	29.6
Welder Primary (Volts)	221	227	229	232	231	223	231	232
Welder Kw.	2.24	3.52	4.32	4.32	3.36	4.0	5.12	5.44
Welder Kva.	6.63	6.81	6.78	6.5	7.21	6.69	7.09	6.87
Power Factor (%)	34	52	64	67	47	60	72	79
At Transf. Sec.	11	13	14	11	13	13	14	14
At Welder	16	18	19	16	19	18	20	19

This welder was tested under field conditions. Welder was located 155 ft. from 3 Kva.—7,620-volt transformer. Service, No. 6 copper wire. **Mfg. Rating:** primary volts, 220; primary amp., 24; Kw., 4.5.

thousand feet of lumber has not increased.

The air receiver is a riveted tank 42 in. in diameter by 72 in. long. The engine used is an 8 x 8 twin double-acting engine, geared to the winding pulley shaft by a 3:1 reduction gear. We have suggested to the owner that he could operate with considerably less air by connecting this engine directly to the winding pulley, but it operates so satisfactorily in its present form that he refuses to experiment with it. The air exhaust is still slightly warm, so that there has been no difficulty with ice formation.

Unfortunately, this particular mill produces a variety of products from different sizes and kinds of logs, and it is difficult, if not impossible, to get accurate comparisons of the production before and after the installation. Since the original installation, the compressor motor has been changed to 100 hp. to give a higher operating pressure, and the compressed air tank usually operates at about 90 lb. per sq. in. No log kicker or nigger is used in this mill. In fifteen months' operation, the customer is completely satisfied with the installation which had an installation cost of about $3,000 including the equipment and wiring.

A small mill at Nelson, B. C., uses a similar carriage drive. In this case the engine is a twin 5-in. x 6-in. engine, driving a 30-in. winding pulley through a 3:1 reduction gear. Air is supplied to the engine from a 185-cu. ft. 950-r.p.m. compressor, belt driven from a 30-hp. motor. The operator is enthusiastic about this carriage drive. Production was increased considerably, and in this case they claim they get increased cable life over either friction or steam installations, but can give no reason why.

Transformer-Type Arc Welders

By T. N. HUNT
The Washington Water ower Co.

THE Washington Water Power Co. like most utility companies has been faced in recent years with an influx of transformer-type arc welders, and the problem of setting a rate that is fair to both the customer and the utility.

Because the initial cost of the transformer-type welder is low, small shops and garages that have a limited use for a welder frequently buy this type of equipment. Many of these customers have only a lighting service supplying electric service to their premises, and they connect the welder to this service with the result that nearby lighting customers often complain about lights flickering. Generally, the only remedy for this flicker is a change in distribution facilities at the expense of the utility. Since the few kilowatt-hours the welder uses will not justify any expenditure for line changes, a minimum monthly fixed demand charge for all transformer-type welder service is charged by the company.

In determining this fixed demand, we usually make a power input test of the welder under actual operating conditions for different welder settings and size rods. Graphic voltmeter, ammeter and wattmeter are connected to the power input side of the welder and readings are taken from the minimum to the maximum welder output settings. These readings are taken when the operator reaches a steady welding operation and not at the start of the weld, when there is a maximum inrush of current. From this test, we then set the monthly fixed demand at approximately two-thirds of the maximum kva. reading we obtained.

Table I shows the test data sheet of a small transformer type welder, which was obtained from a field test of the welder under actual operating conditions. The carbon torch is used for brazing or cutting operations and is optional equipment. The fixed demand for this welder would be 5 kva.

Arc Welding Load Characteristics

By A. L. APPERSON and H. E. ARNETT
Portland General Electric Co.

IN ORDER to determine arc welding load characteristics surveys were made of welding installations used by customers on the lines of this utility. Tests were conducted at typical periods of the day and data worked out on the basis of weekly or monthly operation. Data for three such tests follow:

Steel Tank and Pipe Co.
Portland, Ore.
2:30 p.m., March 18, 1941

	Volts	Amp.	Av. Load 2-Min. (Kw.)	Av. for 2-Min. (P.F.)
AB	470	155	66	.50
BC	472	160		
AC	472	165		
AB	470	170	84	.60
BC	472	175		
AC	472	180		
AB	470	200	116	.72*
BC	472	200		
AC	472	210		
AB	470	240	136	.78
BC	470	235		
AC	472	240		

*Av. load.

Equipment:
9 Lincoln Welders, 300 amp., 440 V., 29 amp., 153 hp.
3 Lincoln Welders. 200 amp., 400 V., 16 amp., 30 hp.
1 Compressor, 440 V., 39 amp., 30 hp.
Deducting 20 kw. (est.) for 30-hp. compressor leaves 116 kw. as Maximum demand for welders only.
Actual meter reading in 7 days..... 9,160 Kw.-hr.
Deduct for compressor (est.)..... 1,080 Kw.-hr.
Used for welders only..... 8,080 Kw.-hr.
2 Shifts Operation: Load-Factor for 7-day period=

$$\frac{8{,}080}{116 \times 7 \times 24} = 41.5\%$$

Pallady Welding Co.
Portland, Ore.
3 p.m., March 18, 1941

	Volts		Amp.	Av. Load 2-Min. (Kw.)	Av. for 2-Min. (P.F.)
AB	237	A	155	18	.40
BC	238	B	160		
AC	237	C	160		
AB	237	A	160	30	.48
BC	238	B	165		
AC	238	C	165		
AB	237	A	180	42	.60*
BC	237	B	180		
AC	238	C	182		
AB	237	A	195	50	.68
BC	238	B	205		
AC	238	C	205		

*Av. load.

Total Connected Load:
1 Lincoln, 150 Amp., 240 V., 24 amp., 7½ hp.
2 Lincoln, 200 Amp., 240 V., 32 amp., 20 hp.
8 G.E. Co., 200 Amp., 240 V., 80 hp.
Maximum Demand for February, 1941, 64 Kw.
Consumption, 12,434 kw-hr.
Load factor, 26.8% for month.

Northern School of Welding
Portland, Ore.
3:15 p.m., March 11, 1941

Tests with "Industrial Load Analyzer"

	Volts		Amp.	Av. Load 2-Min. (Kw.)	Av. for 2-Min. (P.F.)
AB	455	A	70	42	.77
BC	475	B	90		
AC	468	C	105		
AB	458	A	65	38	.78
BC	478	B	85		
AC	470	C	97.5		
AB	458	A	62.5	36	.75
BC	478	B	82.5		
AC	470	C	95		
AB	458	A	72.5	48	.80
BC	478	B	95		
AC	470	C	115		

Total Connected Load on 3-phase Service:
1. Lincoln 150-amp., Motor 440 V., 12-amp.
2. G.E. 200-amp., Motor 440 V., 21-amp.
3. Lincoln 200-amp., Motor 440 V., 22-amp.
4. G.E. 200-amp., Motor 440 V., 21-amp.
5. Lincoln 200-amp., Motor 440 V., 22-amp.
6. Hobart 150-amp., Motor 440 V., 12-amp.
7. Lincoln 150-amp., Motor 440 V., 12-amp.
8. Hobart 150-amp., Motor 440 V., 12-amp.
9. Lincoln 150-amp., Motor 440 V., 12-amp.
10. G.E. 150-amp., Motor 440 V., 11.2-amp.

Power Factor Improvement

Case Study of Commercial Iron Works Shipyards

By R. W. FAVILLE
Northwestern Electric Co.

LAST FALL, this company obtained contracts for building four naval boats, requiring enlargement of their facilities and installation of welding equipment. In September of last year, when they were in partial production, our meter department conducted tests on eleven welders in full normal operation to determine power factor and load.

From these tests it was learned that the average power factor was slightly less than 50 per cent, the load factor was in the order of 35 per cent upon the welding equipment. Other groups of motors were assumed to have a power factor of 50 per cent and a load factor of 25 per cent. The lower load factor for motors other than the welders, is caused by a greater diversity in their use. With a power factor of 50 per cent, the amount of corrective kva. required is 1.1 times the kilowatt demand in order to correct the power factor to 85 per cent.

Since the greatest benefit can be realized when corrective capacitors are applied at the terminals of the motor for which they are correcting the power factor, the recommendation was made that each of the welders be connected to an individual capacitor. If this did not prove to be practical, they should be installed at the outlet to which the welder is connected. It was believed that the installation of the capacitors on the welder unit itself, or at the outlet, would require a minimum expense in their installation and would result in the maximum benefit. For this purpose, capacitor units of 5 kva. each were recommended to correct the power factor of other motors on diversified loads, that multi-unit enclosures for capacitors be installed at the distribution centers. It was estimated at that time, upon a demand of 291.5 kw., and with a monthly consumption of 60,000 kw.-hr., that the monthly power bill would have been $911.50 based upon a 50 per cent power factor. After correcting this load and consumption to 85 per cent power factor, the total bill would have amounted to $757.80. or a saving to the customer of $153.70 if power factor correction equipment was installed. It was estimated that the cost of capacitors, less wiring and installation, would amount to approximately $2,500.

Shortly after our recommendations were made to the customer, a heating requirement for office space came up. Upon study we recommended, and the customer installed, 40 kw. of air heating in the office building, with a resultant increase in power factor correction which enabled them, upon the first monthly billing, to save $39.60. This saving was figured as follows: by test during the month of December showing that the actual power factor upon the 3-phase load was 58 per cent; by correcting the demand to 85 per cent power factor, which, with the addition of the lighting demand, showed a total demand of 342.14 kw.; by using the non-inductive heating load, it raised the power factor so that the actual demand used was 298 kw., which, figured upon the power consumption of 84,730 kw.-hr., showed a resultant saving of $39.60. The cost of the air heaters was $350, which did not include the wiring.

Complete satisfaction with the heating is acknowledged by all of the office workers and the management of the Commercial Iron Works Shipyards.

Case Study of the General Paint Corp.

To obtain information relative to the power factor problems from a new rate application, the above-named company was investigated to determine the resultant benefits obtained from installation of proper equipment to raise power factor to abide by rate schedules now in effect.

A survey of this plant revealed the fact that they had some 23 three-phase motors having a total connected load of 233½ hp. Most of these motors operated single machines, while a few operated line shafts to which were connected several machines. With the exception of the few motors driving the line shafts, most of the motors were operated only intermittently.

A demand test of the entire load showed the measured maximum demand on which billing would be based was 4 kw. for the lighting load and 40 kw. for the power. The power factor at the time of maximum demand was 50 per cent. It was suspected that two of the larger motors driving line shafts were operating very much underloaded. Tests on a 35-hp. motor and a 20-hp. motor showed that the maximum load on the 35-hp. motor was 10.2 kw., which would be full load for a 15-hp. motor. The 20-hp. motor was found to have a maximum demand of 4.5 kw., which would be less than full load for a 7.5-hp. motor.

Since the power factor of induction motors is greatly reduced as the load decreases, it was apparent that some power factor correction could be obtained by exchanging these two motors with smaller sized ones. We suggested installing the 20-hp. motor in place of the 35-hp. motor and using a 10-hp. motor to replace the 20-hp. motor. The following recommendation was based upon the assumption that this change would be made and that the resulting power factor of these two motors would be increased to 65 per cent.

The total reactive kva. required by this plant operating under present conditions, with the exception of the motor change recommended above, was 64 kva. In order to obtain a power factor of 85 per cent, this reactive component would have to be reduced to 27 kva. This required the installation of equipment that could supply corrective capacity in the amount of 37 kva. We recommended that capacitors be installed in the amount of 37½ kva. and that the best arrangement from the standpoint of reducing copper losses in the wiring system and the improvement of voltage at the distribution centers, was that the capacitors be installed in two equipments.

One equipment would consist of 22½ kva. of capacitors in a multiple enclosure with provision for an additional 7½ kva. in the future when required. The other equipment would have an installed capacity of 15 kva. in a multiple enclosure with provision for additional 15 kva. for the future. These would be installed at the two distribution centers fed from each of our two services furnishing power to this plant —the larger at the distribution center furnishing the greatest amount of power.

The cost of such an installation was estimated at $667.50. A tabulation of bills for the months of April through August, 1940, based upon the measured demand with and without the power factor penalty, indicated the saving would be $16.44 per month. It would seem, therefore, that the investment in capacitors and changes in motor sizes recommended above would be a good investment.

The actual installation resulting from this study amounted to 45 kva. in two centers. Power factor and load tests made after the capacitors were installed showed a power factor of between 95 per cent and unity. The operation of the plant at the time the tests were made was such that the maximum demand was not as great as that occurring when the plant was in full production. However, calculations based upon the results of these tests indicate that with the present installed equipment, these capacitors will correct the power factor to a value in excess of 85 per cent. The capacitors remain connected 24 hours per day.

Engineering and Operation Section*

Introductory Statement

THE 18th annual general meeting of of the Engineering and Operation Section met at the Multnomah Hotel, Portland, April 16-18, 1941, with Paul P. Ashworth, Telluride Power Co., chairman. Registered attendance was 211, with 113 from outside of Portland and 98 local. The three days of technical sessions were divided among the six committees of the section, approximately one-half day to each. Most of the papers presented at these sessions and the informal discussion thereon are printed in the following pages. Three papers will be found elsewhere as follows:

In the May, 1941, issue of ELECTRICAL WEST, page 38, there appeared "Modern Methods of Testing Watt-Hour Meters," by C. N. Teed, Idaho Power Co. This paper was presented at the meeting in the program of the meters and services sub-committee.

"Fuse and Relay Coordination for O. C. B. Tripping and Reclosure," by R. M. Wilson and C. E. Cannon, The Washington Water Power Co., the only paper to be presented by the apparatus and design sub-committee, will be published in the July issue of ELECTRICAL WEST.

A paper by M. F. Hatch, The Washington Water Power Co., on "Estimating Secondary Loads from Customer Kilowatt-hours," is scheduled to be published in the June 28 issue of *Electrical World*, because of the particular interest of that publication at this time in the subject treated in the paper. Presentation of it at the meeting was in the program of the Transmission and Distribution Committee.

A summary of the meeting follows, touching principally on those features not published for one reason or another.

The meeting convened Wednesday morning, April 16, at the call of the chairman, who introduced James H. Polhemus, president, Portland General Electric Co., and vice-president of the association for Oregon, for an executive viewpoint. Mr. Polhemus read his paper entitled, "Competition with Public Power," which is printed herein.

The Accident Prevention Committee then took over under the chairmanship of D. W. Prairie, Northwestern Electric Co. All items on the program of this committee are printed except an extemporaneous talk by Chester C. Coon, Safety Live Line Tool Co., who showed excellent color movies of actual work on hot lines using hot line tools. After the picture Mr. Coon answered many questions, indicating considerable interest in this subject by the delegates.

Before the close of the morning session, the newly elected mayor of Portland, R. Earl Riley, appeared briefly to welcome the delegates to Portland.

On Wednesday afternoon the Utilization Committee presented its program with John Bankus, Portland General Electric Co., chairman, under its two sub-committee headings. Paul L. Marble, Puget Sound Power & Light Co., chairman of the illumination sub-committee, led off with discussions of fluorescent lighting and highway lighting. The utilization devices sub-committee, J. E. Yates, Pacific Power & Light Co., chairman, then followed with consideration of load growth, rural electrification and air heating.

The morning of Thursday, April 17, was given over to the Power Production Committee, under E. H. Collins, The Washington Water Power Co., chairman, while in the afternoon, R. J. Davidson, Pacific Power & Light Co., chairman of the transmission and distribution committee, presented his committee program.

That evening the section executive committee met at dinner and nominated for next year's chairman and vice-chairman respectively, Magnus T. Crawford, Puget Sound Power & Light Co. and H. M. Jones, Idaho Power Co.

Approximately 25 members and guests of the meters and services subcommittee met for dinner that evening. Among the guests were representatives of the meter manufacturers. Chester C. Coon, Safety Live Line Tool Co., gave an interesting talk on his recent trip to Mexico, illustrated with color movies. This was an impromptu addition to the program, arranged by request.

F. C. Holtz, vice-president and chief engineer of Sangamo Electric Co., presented an excellent discussion of the developments in watt-hour meters during the past 15 years, illustrated with slides and many interesting sidelights from his wide experience. After some discussion of Mr. Holtz's talk, together with other items of committee interest, during which the chairman suggested that an effort be made to obtain the services of other recognized authorities at future gatherings, the meeting adjourned.

Friday morning, April 18, opened with the report of the Code Committee, by Magnus T. Crawford, chairman. No further program was offered by the committee.

At this point A. B. Campbell, of the engineering staff of Edison Electric Institute, talked on several matters that had engaged the attention of engineering committees in the East during recent months. A summary of his remarks is published hereinafter under the title, "Recent Developments." George C. Tenney, editor of ELECTRICAL WEST, was called on for remarks and responded briefly with a reference to the job this country has set out to do in national defense.

The meeting was then turned over to J. Hellenthal, Puget Sound Power & Light Co., chairman of the Electrical Equipment Committee, and the program of his four sub-committees occupied the rest of the day. These sub-committee programs were conducted by the following chairmen: systems engineering, O. L. LeFever, Northwestern Electric Co.; apparatus and design, by Mr. Hellenthal for the absent chairman, C. E. Cannon, The Washington Water Power Co.; meters and services, C. S. Alger, Puget Sound Power & Light Co.; and operation and maintenance, Carl D. Raney, The Washington Water Power Co.

That evening the general dinner for members and guests was held. On Saturday morning trips had been arranged by the local committee to Bonneville and to the Ampere substation of the Bonneville Administration at Vancouver, Wash., for those desiring to view these latest local points of interest to electrical engineers. H. H. Schoolfield, Pacific Power & Light Co., was chairman of the local arrangements committee, which consisted of members from the local utility companies.

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* Paul P. Ashworth, Telluride Power Co., chairman; Magnus T. Crawford, Puget Sound Power & Light Co., vice-chairman; B. C. Electric Railway Co., A. Vilstrup; The California Oregon Power Co., J. C. Boyle; Eastern Oregon Light & Power Co., O. D. Lanning; Idaho Power Co., H. M. Jones; Northwestern Electric Co., O. L. LeFever, D. W. Prairie; Pacific Power & Light Co., R. J. Davidson, H. H. Schoolfield; Portland General Electric Co., John Bankus, C. P. Osborne; Puget Sound Power & Light Co., J. Hellenthal, George E. Quinan; Utah Power & Light Co., L. B. Fuller; The Washington Water Power Co., E. H. Collins, J. B. Fisken; West Coast Power Co., Henry Berk.

Competing With Public Power

By JAMES H. POLHEMUS
Portland General Electric Company

I AM very happy to have an opportunity to speak to a group in whose hands rest many important problems of the electrical industry, which must rely upon your training and experience for their solution. Among them, and overshadowing in importance all others, is the competitive threat of public-ownership systems fostered by the government through the medium of its Bonneville-Grand Coulee Administration. For some time past it has been patent to all of us within the industry that the former high-sounding pledges of cooperation extended to private industry in the matter of distributing federally-developed hydro-electric power have been relegated to the attic of forgotten things. Even the mask of cooperation has been discarded. It is now the open and avowed intention of the Bonneville-Grand Coulee Administration to convert the Pacific Northwest into a vast public power empire.

We find ourselves in this position: Public ownership has been established in a sufficient number of places in the Northwest that virtually every major privately-owned utility has a "guinea pig" or two in its back yard, sometimes even in its front yard, to point out the shining example of public ownership to the customers of the private concern. These are real competitive threats to our industry.

The best way to beat competition is to meet competition. I am going to hold forth the promise today that there do exist ways for the private utility industry to meet and to beat the competition of public ownership, subsidized and favored as it is by freedom from taxation, arbitrarily low interest rates, misleading bookkeeping, and all the other things by which the publicly owned plant escapes a fair comparison with the accomplishment of private enterprise.

A good practical business definition of "competition" is: "Selling the same thing for the same money." If we understand this fully and keep the meaning of the word clearly before us, there appear a number of openings for throwing a stuff uppercut under our opponent's guard. Public ownership agitation has been carried on upon a platform that has "low rates" as its most important and most compelling plank. The clever men who produce public ownership propaganda know that money is a very tangible thing to all people. They also know that a great deal of the services we sell the people are intangible things. Therefore they have used the tangible and have discarded the intangible. They talk money, or more specifically, rates.

It is my judgment that the key to the question of public versus private ownership of the utility business lies in the problem of giving our customers lower rates—rates that will compete with those of public ownership systems to an extent that will leave not the faintest doubt in the public mind of our ability to match up with publicly-owned systems on a purely cost-of-service basis. Given compaarble rates, there can be no excuse for public ownership.

Remember that meeting competition is selling the same thing for the same money. Our difficulty has been that the private utility business has been selling a different article to the public than the publicly-owned system. We have sold something better and have charged more for it, but we have not been too successful in convincing the public that our article was a superior one worth the small extra cost. It seems to me that in an all-out war such as we now are facing, we are going to be forced to meet the other man's price. And I think we can if we duplicate the other man's merchandise.

For instance, for many years my own company has sold its service on the principle of uniform postage stamp rates throughout its territory. These rates, designed to produce an over-all return upon investments in both densely populated urban areas and the thinly populated outlying areas we serve, necessarily are higher than rates that could be placed into effect were our territory broken down into separate parts and different zone rates applied to each part in accordance with the costs of doing business in each. All of the publicly-owned plants in the region we serve are in small municipalities, and have established rates based on a relatively low cost of doing business. Obviously, we are vulnerable when comparisons are made by the ordinary citizen who does not understand all the factors involved.

Portland General Electric Co. certainly cannot adhere to the principle of postage stamp rates if the public will not recognize it, and to date all PUD's and municipalities distributing Bonneville power have adhered to the surcharge principle; that is, placing a surcharge upon the standard Bonneville rate in accordance with the varying costs of doing business in each community.

In addition to factors involving the region a utility serves, which necessarily must reflect themselves in the utility's rate structure, there are the costs of underground distribution, stand-by service, adequate repair equipment and crews, free services and other items. It may be possible to eliminate or curtail some of these services which make up the complete package which we sell the public, in order to make our product more nearly the same as the other fellow's.

In our own case, by zoning rates, I believe that it is not impossible to continue delivering the public a superior type of service and at the same time meet competitively the present standard Bonneville type of rate. In time, we hope to reach this end by efficient engineering, streamlined operation, and aggressive loadbuilding, cutting costs in every possible manner.

The problem of designing "surcharged" or zone rates for various parts of our area is not a simple one, inasmuch as rates properly should be a function of current use as well as actual costs of service. It is conceivable that rates in certain of our rural areas might be as low as those in certain towns. On the other hand, a low rate suitable for small towns may not prove practical for a large city where the utility is called upon to supply expensive direct current service and underground distribution.

Private utilities also have distinct advantages over many publicly-owned systems which will go a long way toward winning the competitive battle. Because of higher load factor, private utilities can buy Bonneville power cheaper than can the typical municipal system or PUD. As a result, it is possible for the private utility to dilute its own generation with subsidized federal power more and more as use of energy by the public increases, and in so doing bring its power costs, including taxes, down to a level comparable to that at which the small, poor-load-factor municipal or PUD system can buy tax-free Bonneville power. This advantage alone may offset the tax-subsidy and other advantages which the public setups enjoy.

The compact, well-managed private utility also, I believe, is equipped to do a superior job of loadbuilding; nor should it play second-fiddle when it comes to efficient engineering and operations. That's where you fellows come in.

While I have tried to emphasize that we are in a competitive fight, nevertheless it is my hope that it will remain a good-natured one. There is real need for cooperation among all the privately-managed and publicly-owned power resources of the Northwest in this day of

preparation for national defense. There is an obligation on the part of private utilities to make power from their standby plants available wherever it is needed to aid the national defense program, particularly during the coming summer when drouth conditions are expected to produce local power shortages. On the other hand, the Bonneville and Grand Coulee projects have an equal obligation to supply the private utilities, many of whom stopped development of additional generating capacity at such fine plants as Oak Grove, Ariel and Rock Island, when the federal government began to build Bonneville and Grand Coulee.

Recent Developments

By A. B. CAMPBELL
Edison Electric Institute

MOTOR STARTING CURRENTS—A joint committee has recently been formed by Edison Electric Institute and the National Electrical Manufacturers Assn. to study the values for motor-starting currents under various conditions. This subject has been under consideration for many years and at one time, the National Electric Light Assn. had a set of motor-starting rules. These were rescinded a few years ago. The joint committee consists of about five members from each group and the electric light and power group consists of a representative from the Association of Edison Illuminating Companies, the General Sales Committee, EEI, Rate Research Committee, EEI, Transmission and Distribution Committee, EEI, and the Electrical Equipment Committee, EEI. The approach being made to this problem shows promise of accomplishing some worth while results, and it is possible that an understanding will be reached reasonably soon between manufacturers of motors and power companies.

DISTRIBUTION CUTOUTS AND POWER FUSES—This is a joint committee between the EEI and the NEMA, and a standard has been prepared and voted on in the EEI Transmission and Distribution and Electrical Equipment committees. Of the various utility companies voting on this standard, a large majority has voted affirmatively, and the standard shows promise of being acceptable to both organizations.

STANDARDS FOR INSULATORS—A joint committee with NEMA has been formed recently for the purpose of standardizing porcelain insulators and the necessary gaging equipment to check the threads. This committee will endeavor to prepare standards mainly for pin type insulators, resorting to the test specifications that have recently been approved by the American Institute of Electrical Engineers.

There has also been formed a joint committee between the EEI and representatives of the lime glass insulator manufacturers, which will endeavor to prepare a standard for pin type lime glass insulators with the necessary gaging equipment. These will also be based upon the electrical characteristics given in the insulator test specifications recently promulgated by the AIEE.

DISTRIBUTION TRANSFORMER STANDARDS—As was explained by Mr. DeMerit and Colonel Herzberg at the meeting of this association held in Spokane last year, a standard has been prepared for distribution transformers which covers the field up to 25 kva. and up to 15,000 volts. The material presented by these men last year was published as a First Report, EEI Publication G-6. Since this was issued, the joint committee has continued its study of standardizing distribution transformers up to 100 kva. in capacity. Progress is being made and it is expected that the Second Report, which will include all that was in the First Report plus the additional material for the larger sizes of transformers, will be published in the near future.

RKVA METERING, DEMAND METERING, POWER FACTOR—A committee has been formed within the EEI to study the problems of RKVA metering, demand metering, power factor, etc.—the committee being formed from representatives of the Rate Research, General Sales, Electrical Equipment, Meter, and Transmission and Distribution Committees. The formation of this committee was sponsored by the Rate Research Committee, which has had the subject under consideration for the last year or so and had encountered problems on which engineering advice was needed. The committee's first study will be concerned with the problems relating to water heating, electric welding and fluorescent lighting.

NATIONAL DEFENSE.— Engineering committees are giving considerable study to meeting the problems involved with national defense. This includes making available adequate power for defense plants and in being prepared to offset possible damage from sabotage. A great deal of study has been given to the protection of manholes and cable vaults with the view to making them inaccessible to unauthorized persons. The general consensus appears to be that such measures are likely to be ineffective and that the preferable solution will be to have emergency stocks of cable and equipment on hand in order that service may be quickly restored in case of outages due to this cause. Consideration is also being given to the operation of underground cables at higher temperatures in order that additional capacity might be provided over existing cable systems.

WOOD-POLE STANDARDS—Since this group held its meeting last year, the American Tentative Standards for Wood Poles have been raised to the status of American Standards under the American Standards Assn. These standards are six in number, namely: for Western red cedar, Northern white cedar, Douglas fir, Southern yellow pine, chestnut, and lodgepole pine. Provision is made for investigation to see if any changes are necessary based on the experience over the past several years in working with the tentative standards. So far, few proposals have been made for modification, and offhand it would appear that their further consideration is not urgent at present.

EEI ENGINEERING COMMITTEES—The engineering committees of EEI scheduled its annual group meeting for May 5 to 9 at the Edgewater Beach Hotel in Chicago. Perhaps the most pressing problems before the Accident Prevention Committee at present are those relating to electric fences, pole-top resuscitation and employee training. The electric fence question is mainly a question of conducting educational work among users of electric fences to see that only recognized controllers are used and to discourage the use of homemade devices. Also, an effort is being made to reconcile the differences in current values between the rules prepared by a committee on the revision of the National Electrical Safety Code and the standard issued by the Underwriters' Laboratories, Inc. It appears that these differences will be reconciled, thus bringing to an end the confusion now existing in the use of these two standards.

Pole-top resuscitation is also a question needing further study. It is being favorably received by many companies throughout the country, some of which have adopted a technique for applying it. It will be studied in connection with other resuscitation problems by the Resuscitation Review Board, on which are several eminent physicians who have been interested in resuscitation and electric shock, as well as several qualified power company representatives.

Employee training is receiving a great deal of attention by the Accident Prevention Committee. The former

publication, Accident Prevention Course for Linemen, long since out of print, is being rewritten and it is expected it will be available for comment within the next few months. Companies generally recognize that employee training is one of the most effective methods of dealing with accident prevention and safety problems and a great deal of effort is being devoted to this subject.

NATIONAL ELECTRICAL CODE — Mr. Crawford has given a very complete report of the status of the NEC. The report on Type S fuses prepared by the special committee within the Electrical Committee, NFPA, was scheduled for discussion at the meeting of the Electrical Committee, June 10 and 11, in Chicago.

Much study is being given at present to the new table on current carrying capacity of wires, in the 1940 edition of the NEC. Also, there has recently been formed a joint committee between the Electrical Committee and the Sectional Committee on the Revision of the National Electrical Safety Code to make recommendations regarding the differences in the requirements in Part 3 of the NESC and the corresponding rules and requirements in the NEC.

NATIONAL ELECTRICAL SAFETY CODE —The status of this code is that on Sept. 10, 1940, a list of changes was submitted to the Sectional Committee for letter ballot in Section 1, dealing with definitions, and Part 2 which consists of Rules for Overhead and Underground Supply and Communication Line Construction. This letter ballot failed to receive the required 2/3 majority by one vote, but recently a special committee appointed by the National Bureau of Standards, has studied the differences of opinion and made a supplementary recommendation which is now before the Sectional Committee for letter ballot. Inasmuch as this special committee consisted of representatives from those who voted negatively on the preceding ballot, and since this recommendation has the approval of these negative voters, it is fully expected that the present letter ballot will carry.

Several important changes have been made in this revision as follows:

Clearances—Clearances are treated in a somewhat different manner than they have ever been before, due to the fact that since the present code was written many conductor sizes and materials, and types of construction have become common which required rules that had not previously been necessary. A wire crossing rule and rules for wires over streets, highways, rails and above ground are now set up on a basis which requires increased clearances only where necessary, due to the characteristics of the material concerned and span lengths used to provide clearances comparable with those for shorter span lengths in the preceding edition of the code.

Sags and Tensions—Previously the code required a limit in the heavy loading district whereby the conductor would not be stressed beyond 50% of its ultimate strength under Grades A and B, or 60% under Grade C. This has been modified by permitting all power line grades now to be stressed up to 60 per cent of their ultimate strength.

Grades of Construction—Revisions of tables 14 and 15 in the present code have been made due to the fact that Grades A and E in the present edition of the code have been eliminated. There are now two grades of power line construction, namely B and C, and one communication grades which is Grade D, the latter applying only where communication lines cross railroads. The elimination of Grade A is due largely to the fact that the performance of Grade B in the present and past editions of the code has been such as to indicate that this was sufficiently strong as the highest grade to be required. The division point between Grades B and C, based on voltage, is 2,900 volts to ground. Provision is made, however, for the higher primary voltages being permitted to be built on Grade-C supports, provided circuit protective equipment is used both on power and communication lines which will reduce the over-all hazard to that considered comparable with the hazard normally existing under the present Grade-C construction. It is believed that this will permit many cases of joint use construction with the higher primary voltages using Grade-C strengths.

What is perhaps one of the most important changes in the revision of Part 2 of the NESC is in the rules which will permit omitting numerous guys that have been required in the past. It is recognized that guys, where unnecessary to support a continually unbalanced load, are generally undesirable in locations where lightning is prevalent. In straight tangent sections where power lines cross over communication lines or railroad tracks, and wood poles are of sufficient strength to meet the transverse loads imposed upon them by the assumed climatic loading conditions without the use of side guys, these poles will be considered of sufficient strength to carry the longitudinal loads without head guys.

Another important change made in the climatic loading assumptions whereby the 8-lb. wind that applied in heavy and medium loading districts has been reduced to 4 lb., and the 12-lb. wind loading in light loading districts has been reduced to 9 lb. No changes were made in the ice loading assumptions in either the heavy or medium loading districts. Generally speaking, this reduction of wind loading, which applies transversely to the line, has been accompanied by a corresponding increase in factors of safety (although the term "factor of safety" is not used in the code) so that the over-all strength for Grades B and C construction remain practically unchanged.

While the study of the ice and wind loading throughout the 10-year period 1926-36 indicated that a reduction in actual transverse loading was justified, this study also showed that no reduction in longitudinal conductor loading should be made. Accordingly, there has been added to the resultant of the new assumed ice and wind loading a constant, different in each of the three loading districts, which results in practically no change in the practice of stringing and operating overhead line conductors. This also makes it possible to use existing sag and tension charts that have been prepared by the manufacturers of conductor materials, based on 60% of their ultimate strength, without change, as these constants result in such small differences in sags and tensions that they are easily within the range of the accuracy of conductor stringing.

It is felt that the changes made in Section 27, dealing with line insulators, will clarify the present code requirements for this section. The present code is not clear in several respects, nor does it call for rules in accordance with present day engineering. The revisions have brought the rules in this section up to date and are considered by all concerned as an improvement over the rules in the fourth edition.

Section 29 on underground construction has been changed in a number of minor details, in addition to including rules which recognize the use of buried cable, both for power and communication purposes.

There is no question that Part 2 will be somewhat more complicated than Part 2 of the present code, although many points have been clarified where the wording has been made to base the rules for minimum requirements on characteristics of materials and to cover all situations without penalizing any unnecessarily. It is expected that this will be met by a more comprehensive supplementary handbook of discussion which is being planned for publication following the revision of the code. Several instances will be described in considerable detail as illustrative of how the rules, which may be difficult to understand, should be applied.

Accident Prevention Committee*

Injury Experience

By DONALD W. PRAIRIE
NORTHWESTERN ELECTRIC CO.

The thirteen electric utilities which reported personal injury experience for 1940 showed a total of 23,740,614 man-hours exposure; an increase of 3.26% over the year 1939 and the highest on record for the Association. But there was an increase of less than 0.2% in number of accidents. Thus the frequency dropped a shade—to 14.07 from the 1939 figure of 14.28 per million man-hours exposure.

There were 8 fatalities during the year: one each in five of the companies and three in another. This is up two from the year before, a 25% increase. Number of man-days lost jumped from 48,448 in 1939 to 56,786. Counting 6,000 days to the fatality, we have 8,786 man-days lost in non-fatal accidents. This compares with 12,448 days lost in the 1939 non-fatals.

According to the judgment of those who classified their accidents according to cause, there is a striking sameness from year to year. In 1939 there were 44 out of 328 judged due to supervisory responsibility, as against 261 due to employee responsibility, with 23 unclassified. In 1940 there were 49 out of 333, with 72 unclassified, showing 212 as employee responsibility.

The types of accidents and nature of injuries also show a marked degree of sameness from year to year.

Of the 284 accidents classified as to occupation of worker, by far the greatest number and most severe were experienced by the transmission and distribution departments. The generation and transformation departments were next in both frequency and severity and, as is to be expected, the general shops, sales and administrative departments suffered the least. The figures are as follows:

Class	No. of Accidents	Man-Days Lost	Fatalities
Transmission and distribution	187	21,895	3
Generation and transformation	58	6,707	1
General and administrative	39	3,770	0
Unclassified	49	24,414	4

When the Association's frequency and severity rates of the past 12 years are plotted on a curve and compared with a similar curve of the national average for electric utilities, we find a definite agreement in trends. The beginning points of 1929 were high in both cases. The curves dropped sharply to the lowest points during the year 1933, then they started up again. The severity curves rose to the next highest peak in 1935, dropped considerably in 1936, and then rose again in 1937, from which point they declined again to another low in 1939. The frequency curves show a more regular adherence to the established trend.

Two conclusions may be drawn from these sets of similar curves. The first is that the causes effecting the accident experience of our particular group are common to our industry throughout the nation. The second is that the rise and fall in frequency and severity undoubtedly parallels system expansion and kwh. output, inasmuch as both sets of curves definitely follow the rise and fall of the general business curves of the years covered.

In view of the present emphasis on system expansion and especially increased kwh. output, these two charts should constitute a challenge to all safety men and operating executives in our group; a challenge to conserve man-power, in spite of the hazards being placed upon us by the feverish rise in the industrial thermometer.

1940 National Safety Congress

By E. E. BECK
Idaho Power Co.

AT THIS TIME, after the thousands of impressions received at the National Safety Congress have had a chance to settle and the froth has disappeared, I have a lasting impression of seriousness. Seriousness, caused by the knowledge that the greatest safety campaign in the history of the world was being launched; a ten-billion-dollar campaign to make our country safe to secure the future of every man, woman and child in it. Along with that knowledge came the thought that the present type of war, a mechanized war, is won in the factory. Since this is a fact, the civilian is on the front line just as they have been in Poland, France and England and there accident prevention and first aid became important chapters in the civilian's book of knowledge.

Who teaches accident prevention and first aid? You and I, specialists in our line, enter on the stage of national defense at this point. All of the leading speakers at the congress stressed that point. From various angles, these speakers tried to drive home the thought of the increased importance of accident prevention work at this time. Those speakers were prominent men in all walks of life and their sincerity was very evident.

If I am to tell you of my own impressions of the Congress, the story would be incomplete unless the reaction to these impressions were also told. At a previous meeting of the National Safety Congress, C. J. Rutland, Safety Director of the Texas Power and Light Co., impressed me by some of the thoughts he expressed in connection with accident prevention. Upon inquiring, I found that this man was busy with public safety work, and could not get away this year to attend the Congress. He is a leader in accident prevention in Texas and is partly responsible for the excellent record that the city of Dallas made last year in the prevention of traffic accidents. With this man as an example, I volunteered my services to our state safety director and am working with him at the present time striving to reduce our state's accident record. Please excuse any appearance of dramatization, but this is a time for sacrifice and hard work. This is a time when all of us, if we are worth our salt as citizens, should, within our ability, give the benefit of our experience and some of our time to the agencies who are trying to reduce the local accident toll. In that way, as specialists in our line, we can best serve our nation now.

The second impression which has remained with me, after six months time has elapsed, is the possibility of improvement by streamlining our safety programs to meet the needs of modern times. In the enthusiasm of the training period of safety work which we all experienced, figuratively, we tried to put goggles on our presidents. In other words, if our enthusiasm had been allowed to run riot, we would have made the job so safe that produc-

* D. W. Prairie, Northwestern Electric Co., chairman; Eldon E. Beck, Idaho Power Co., vice-chairman; B. C. Electric Railway Co., B. deM. Mertens; The California Oregon Power Co., C. C. Haggard; Eastern Oregon Light & Power Co., B. F. Lentz; Mountain States Power Co., W. Smith; Pacific Power & Light Co., George I. Drennan; Portland General Electric Co., A. H. Kreul, E. D. Searing, John S. Volpe; Puget Sound Power & Light Co., H. G. Winsor, H. E. Worthen; Telluride Power Co., Paul P. Ashworth; Utah Power & Light Co., W. L. Cone; The Washington Water Power Co., J. B. Fisken; West Coast Power Co., Henry Berk.

tion would have been impossible. I feel sure, from my conversation with you and others, and from my own experience, that there are left-overs from that enthusiastic training period which could be eliminated from our program to the advantage of all.

I will not ask you to draw on your imagination to determine what is meant. First, drop the idea that you, with the help of whoever is in your department, can reach the maximum of success without the physical assistance of other department heads in your company. The president, of course; but regardless of his ability and the prestige of his position, he is only one man and you need the help of the sales, accounting, distribution, power plant executives to reach the ultimate in your endeavor.

Second, wishful, theoretical safety thinkers remind me of the southern preacher who was asked to pray for rain. He prayed as follows: "Oh Lord, these people have asked me to pray for rain and so I'm praying, Lord. But, Lord, you know and I know, and they ought to know, that what they need is not only rain, but deeper plowing, more fertilizer, and better cultivation." Apply that story to your safety program. Deeper plowing to a safety man should mean harder work. We should expect to step up our tempo in line with the national speed-up. More fertilizer means more help. The safety department helps every department in the company. The safety director has a right to expect reciprocal help from all department heads. Better cultivation certainly means closer relations between you and the people whom you are endeavoring to lead in accident prevention. And so, give your program a thorough going over with a fine tooth comb and throw away the antiquated residue.

The third impression was based on an experience. I spent one entire day with the Chicago Commonwealth Edison Co. in a study of their employee training program. Their program is very practical and very possible of imitation in any company, regardless of size. As a background for this program, there must be a realization that in these times labor turnover is small. When an employee is carried on our payroll past the training period and becomes a regular employee, he is practically married to the company for the rest of his productive life. Therefore, in the interest of both the employee and the company, a training program should be inaugurated in order to make a better man of that employee in a shorter time, and the Commonwealth Edison Co. has proved that it can be done by training. The following are some of the high lights of the program:

Employees, up to and including foremen, are promoted following an examination. Accident prevention takes up about one-third of the examination and the rest of the examination is made up of questions on production, with the exception of a few questions on the company's general policies. The examinations are based on company written textbooks. Examinations are not held periodically but as the demand for men is apparent, in any certain grade. This company has groundmen, three grades of linemen, trouble shooters and foremen. Examinations are required not only for linemen but for all the production branches of the company. A part of the linemen's examination is based on physical demonstration in a training yard.

Such a program is of direct benefit to the employees in this way: In a training yard under a competent instructor practical conditions may be set up. The groundman learns to climb, the apprentice learns part of his trade and the total result is that the time between the various steps of promotion may be materially lessened. The benefits of such a condition are evident.

The company benefits from the entire program in this way: Since part of the examination is on the safety rules, the safety director is assured that the employees have a thorough knowledge of those rules. The management of the company is assured by examination that the employees have a knowledge of the company's general policies. The production department is assured by examination that the employees in certain grades have a certain knowledge, for instance, top linemen will have demonstrated by answering questions that they know the specifications which govern the building of your lines.

Frankly, why should not such a program be of benefit when applied in any department of your company? Certainly you cannot hire finished accountants for beginners in the accounting department. Train them and make a part of that training a knowledge of accident prevention as applied to accountants, such as better light, less noise, office hazards, and employees' health. Be sure that they have a knowledge of the company's general policies. The Idaho Power Co. is preparing such a training program.

Electric Fences

By W. R. VOLHEYE
Chief Electrical Insector, Oregon

THE Oregon State Bureau of Labor, charged with the responsibility of electrical inspection, made a study of electric fences in 1936 and issued specifications covering installations in December of that year. These were among the earliest, if not the first, specifications set up in the United States. They required that the shock period be limited to 1/10 of a second and that the current not exceed 45 milliamperes.

Oregon law covering electrical inspection provides that no equipment not approved by some recognized inspection agency may be sold to the public. In 1936, none of the recognized inspection services had a standard for electric fences. So the Oregon department of labor made arrangements with Oregon State College for testing electric fence equipment offered by manufacturers for sale in Oregon. The state college acquired the necessary inspection equipment and made a charge to the manufacturer for this service.

In Jan., 1937, Wisconsin set up a commission to study the electric fence situation, and in 1938 that commission wrote specifications quite similar to those we had already established in Oregon. In May 1940, the Bureau of Standards issued Part VI of the NESC and Underwriters Laboratories now has standards for testing this equipment.

Since setting up our own inspection service at Oregon State College we have tested about 50 fences and given permits to 22 manufacturers. There has been only one death in Oregon and this was due to the breaking down of a transformer. We were never able to find out whether this death occurred with 9 milliamperes or with unlimited amperes. When we examined the device which the owner and all others said had not been touched since the accident, it showed that the device was delivering only 9 milliamperes.

There was a death in Washington a few years ago. Of all the accidents we have heard of in this vicinity from electric fences, only one has occurred on equipment made by registered manufacturers. The others have all been on home made devices.

We would like to discourage the use of electric fences, but we can't very well do so because they are too valuable to the farmers. They are frequently used for temporary fencing of small areas such as a portion of a pasture. They are very easily installed and moved and the farmer can pregressively move his cattle across the field, confining them at all times to the small area he wants them to feed in periodically, so as to get the most out of the pasture.

E. E. Beck—The Utilities Commission of Idaho has ruled that no electric fence controllers can be sold in Idaho not conforming to the N.E.S.C. standards.

Pole Top Resuscitation

By GEORGE I. DRENNAN
Pacific Power and Light Co.

BEFORE talking about pole top resuscitation, I would like to offer some comments on safety activities in general. It seems to me safety men are called upon to do too much with too little—that they are expected to produce results but are given insufficient funds and personnel with which to accomplish these results. You have to put time, effort and money behind the program. If we could increase our organizations and spend enough money we would get results in direct proportion to the extent of such activity.

Eliminate the faults and you bring your accident curve down. The faults are human and material, and the key to successful safety activity is intensive training, and by this I mean training in safe methods of procedure and work. Men don't like the idea of resuscitation. They don't like to see a man burned or cut up, nor to go through such an experience themselves. If we spend sufficient time eliminating faults, there would be little need for first aid training.

As to resuscitation, the time element is important. This is the reason for starting it on the pole. The technique is simple, but it requires training. Our company is conducting a school in this technique. We want to go along with the trend.

E. E. BECK—We have been teaching a newer method in addition to the older method of pole top resuscitation, but whichever method should be used depends on conditions. Sometimes it is even better to let the injured man down to the ground and there apply the prone-pressure method. The determination of what to do in any case should be that of the lineman or the foreman. Whatever the leader of the party does, the company should back him up.

Special Meeting Accident Group

By D. W. PRAIRIE and E. E. BECK

ONE company considered installing eye-testing equipment and wanted information. Only one other company had experience. The representative of this company reported that the entire personnel had been examined once and that the examination revealed many cases of faulty vision which were unsuspected. Under no condition were employees allowed to gain the belief that the test was in the nature of a diagnosis of eye trouble or prescription for correction. If the examination indicated any eye fault or weakness, the suggestion was made that the employee consult a competent oculist. The belief of the experienced company was that if eye-testing equipment were used, it would be well worth while.

One of the members, who was also a member of the school board at Walla Walla, reported that the school system there had installed an eye-testing machine and was well satisfied with the results. It had done an immense amount of good to the school system in discovering unsuspected eye deficiencies among the children.

Discussion was introduced by a guest from the U. S. Engineers relative to the merits of attempts being made to standardize safe working practices and safe construction codes throughout the eleven western states, and opinions were varied as to its feasibility. There was general agreement that if standardization could be achieved, it would bring about definite improvement in the safety picture. However, because of the many difficulties involved in achieving such standardization, it was generally agreed that the movement might not be successful.

The subject of rubber gloves was reopened, and it was learned that all companies are sterilizing their gloves with each testing. Also revealed, none of the companies represented handled voltages of 11,000 and above with only rubber gloves for protection. The development of curved fingers and rolled cuffs was discussed. George Drennan reported that Pacific Power & Light Co. had started using rolled cuffs and he would be able to report on their efficiency at next annual meeting.

K. L. Davey, Davey Tree Surgery Co., discussed his company's system of employee training with particular reference to its safety aspects. He explained that all accident-prone men were weeded out of the personnel during the new employee training course.

A request was introduced for information which would be of assistance to one of the companies in estimating its annual accident prevention costs. It was learned that the U. S. Engineers have a workable plan of predetermining their annual budget on the basis of $4.00 per thousand man-hours worked.

Utilization Committee*—Illumination†

Fluorescent Power Factor Correction

By HILBERT S. JOHNSON
Portland General Electric Co.

Before the announcement of the fluorescent lamp about two years ago, the problem of power factor correction of lighting equipment was confined to Neon signs and a few applications of mercury vapor lamps. However, fluorescent lighting has changed the entire picture. With the wide-spread use of the fluorescent lamp in all phases of lighting it behooves the utilities and the entire electrical industry to consider seriously the effect of this new lighting tool on the cost of supplying it with energy. Some estimates have placed the present fluorescent lighting load as about 10% of the total commercial and industrial lighting load.

With such a growing use of a type of load that inherently has a power factor of about 55% we must certainly be concerned. The utilities must do most of the pioneering in the solving of the problem since it affects them the most. In the past it has been the incandescent lighting with its practically 100% power factor that has been the saving grace in compensating for the motor load that brought down the over-all power factor. Now, with rates being reduced to even lower values, it is imperative that the lighting load be so maintained as to keep the same stabilizing effect on the over-all power factor. Otherwise, rates must be changed to compensate for the additional investment in plant and distribution systems necessary to supply the increase in worthless current.

* John Bankus, Portland General Electric Co., chairman; O. D. Lanning, Eastern Oregon Light & Power Co., vice-chairman; and members of sub-committees on Illumination and Utilization Devices.

† Paul L. Marble, Puget Sound Power & Light Co., chairman. B. C. Electric Railway Co., R. Hall; Idaho Power Co., Orland C. Mayer; Pacific Power & Light Co., G. B. Bocarde, K. W. Moore; Portland General Electric Co., F. H. Murphy; Puget Sound Power & Light Co., C. T. Bakeman; Utah Power & Light Co., J. C. Littlefield.

Without the help of the entire electrical industry the utilities will not have satisfactory results. The manufacturers of equipment, the jobbers, and the contractors must be shown the necessity for maintaining high power factor not only in lighting loads but also in all types of loads. When the consumer is told of the advantages of high power factor from a unified industry, excellent results will be obtained.

Such a program is shaping itself at the present time. Several excellent studies have been made of the effect of fluorescent lamps on the power system —one in particular by the Bureau of Power & Light of Los Angeles, and another by the Electrical Testing Laboratories of New York City, which will give some ideas of the technical problems involved in correcting the power factor. The reliable manufacturers have on the market equipment which is satisfactory, and they advise power factor correction in their sales literature. The jobbers are helping by stocking the proper equipment and in many cases, when it is within their power, to specify corrected devices. The weakest link in the program at present is a few of the electrical contractors and fixture salesmen who underbid competitors by installing the slightly cheaper low-power-factor devices.

It is for these few that the utilities must have penalty or surcharge clauses in their tariffs in order to protect the honest efforts of the majority.

The first and logical step toward correction was by means of small capacitors to be connected to each individual unit or to separate groups of units. But so many changes were occurring in the design of auxiliary equipment and fixtures that manufacturers and jobbers were cautious in carrying a stock of capacitors or corrected units in fear of improvements that would render their stock obsolete. Utilities could only recommend the use of high power factor equipment and hope that the equipment was available.

Now, equipment has been stabilized so that present stocks will not become obsolete overnight, and the jobbers and manufacturers can have suitable equipment available. The greatest single development is the tu-lamp auxiliary which makes use of one lagging and one leading power factor ballast installed in one case which not only brings the apparent power factor of two lamps operating together to above 90% but also corrects for stroboscopic effect. Its use is encouraged by the fact that one tu-lamp auxiliary costs about the same as two single low-power-factor ballasts.

An interesting problem brought out by a report on operation data of fluorescent lamps is that while the apparent power factor obtained by the voltmeter, ammeter, and wattmeter method of test reveals a value above 90% can be obtained, the actual power factor as obtained by observations of the wave form shows that very seldom does the power factor go above 85%.

In addition to the tu-lamp auxiliary, which is used almost entirely in packaged units, single-lamp auxiliaries are available with inbuilt capacitors which provide proper correction. When correction is needed on existing installations the separate capacitors are used. When using a group of capacitors to correct an existing installation, it is necessary to balance the capacitor load to avoid unbalanced voltage which could interfere with the lamp operation.

As far as Neon sign equipment is concerned, the quality has improved by the demands of the utilities for higher values of power factor. At present most manufacturers have neon transformers available that correct the sign to about 90% when properly loaded. The difficulty encountered with sign companies is competition which frequently results in the use of the cheaper transformers. A strict enforcement of power-factor regulation in tariffs would eliminate this nuisance. The market for neon or luminous-tube signs is almost saturated so that the problem is one of keeping a strict regulation on subsequent installations which will eventually replace most of the present under-corrected signs.

In order to effectively obtain power factor correction it is necessary not only to "sell" the industry and the consumers on its advantage but also to provide some form of regulation in either the rulings of the State Commissions or the tariffs of the utilities. Of the two methods of regulation, the rulings by the State Commissions is probably the most desirable from the standpoint of the utilities. Since, however, only two states — Kentucky and Oklahoma—have rules requiring high power factor on gaseous tube lighting, it is necessary that utility rules be made to cover the subject.

Some utilities do not favor such rulings and base their belief upon the thought that the rulings will be detrimental to customer relations and that eventually the power factor will be improved by available corrected equipment. Utilities that have rulings covering power factor of gaseous tube installations may be divided into four classifications as follows:

Charging for Uncorrected Installations
(In the group are such companies as:)
1. Portland General Electric
2. Northwestern Electric
3. Washington Water Power
4. Central New York Power Corp.
5. Central Illinois Electric & Gas
6. Louisiana Power & Light
7. Northern States Power
8. Oklahoma Gas & Electric
9. Maine Public Service

Prohibiting Uncorrected Installations
1. Commonwealth Edison
2. Kentucky Utilities
3. Public Service Co. of Northern Illinois
4. Western United Gas & Electric
5. Northwestern Public Service
6. Wisconsin Electric Power
7. Illinois Northern Utilities
8. Central Illinois Light

Providing Company May Require Correction
1. California Oregon Power
2. Puget Sound Power & Light
3. Southern California Edison
4. Southern Utah Power
5. San Diego Gas & Electric
6. Columbus & Southern Ohio Electric
7. Pacific Gas and Electric
8. Illinois Iowa Power

Providing Customer Must Provide Correction
1. Los Angeles, City of
2. Southern Colorado Power
3. Public Service Co. of Oklahoma
4. Central Arizona Light & Power
5. Arizona Power Corp.
6. Erie County Electric
7. The Hartford Electric Light
8. Kentucky & West Virginia Power
9. Keystone Public Service
10. Erie Lighting
11. Cheyenne Light, Fuel and Power
12. Connecticut Power

Of these rulings, the one that gives the best results is the one that does not prohibit the use of low-power-factor equipment but is designed so that it is to the customer's advantage to use the corrected equipment. By means of such a ruling the customer will make an effort to provide the necessary equipment so that he will not have to pay an additional charge.

Although such a ruling may seem hard to enforce and yet maintain proper customer relations, it will not be hard to explain the necessity for such action when rate reductions are being made periodically.

It must be remembered that unless a firm policy is established during this, the developmental stage in fluorescent lighting, it will be more difficult to control the trend toward a lowering of the stabilizing power factor of lighting when the fluorescent lamp becomes the major part of the lighting load.

Fluorescent Aids To Customer

By Paul L. Marble
Puget Sound Power and Light Co.

OUR company has produced a "Manual of Fluorescent Lighting Objectives," to be of assistance in the better application of fluorescent lighting for a fuller realization of its benefits by customers, and a more substantial return from this market by the trade.

The Puget Sound Power & Light Company has confidence in the future of fluorescent lighting. It offers an opportunity of providing twice as much light to our customers with no increase in kw.-hr. costs. Properly sold, it can provide several times the existing light with only a slight increase in kw.-hr. cost. Properly applied, it can provide light for applications not possible before, opening many new markets.

Briefly our sales policy is:

1. We are *for* fluorescent lighting.
2. We want to assist in selling higher levels of fluorescent lighting for full customer advantage.
3. We want to assist in selling better quality of fluorescent lighting for complete customer satisfaction.
4. We want to assist in opening new lighting markets with fluorescent.
5. We are aggressively promoting these things to our customers and the trade.
6. We do not hesitate to give our customers full facts on fluorescent.
7. We want to guard our customers against making substantial payments for equipment in the hope of a saving in lighting cost that isn't possible.
8. We want to assist our customers in obtaining maximum benefit from fluorescent and other sources by advising them of the best applications of each.

We believe this sales policy aggressively carried out, will:

Give our customers greater value instead of poorer light.

Give our customers more light for their kw.-hr. money.

Make fluorescent a market builder instead of a market loser.

A comparison of recent outstanding installations developed under this program proves the value of this policy. Footcandles on the average were nearly doubled. Bare bulb installations were cut to one-half. Load density in watts per square foot and the installation volume to the trade were more than doubled. These outstanding installations are a few among many and our job lies ahead.

APPLICATION ADVANTAGES

Efficiency

1. High level general lighting.
2. Maximum utilization of wiring capacity providing higher power factor is used.

Efficient Daylight

1. High level for true daylight impression.
2. Daylight color inspections.
3. Contrasts in color effects.

Coolness

1. Perishable goods display.
2. Reduction of physical discomfort.
   a. High level lighting.
   b. Light source close to persons.
3. Not a factor in the reduction of dye fading.

Tubular Shape

1. Cases - Coves - Niches.
2. Lineal lighting applications.
3. Lineal architectural designs.
4. Large area source with lamps grouped.
5. Reduction of shadows.

Low Surface Brightness

1. Reduction of reflected glare.
   a. Not to be exposed in line of vision, directly or by mirror reflections.
2. Reduce shadow effect.
   a. When closely spaced or grouped in large area sources.
3. Disadvantage for projection or spot lighting.
4. A disadvantage for refraction of brightness, such as in diamond displays.

Color

1. Decorative effects.
   a. Theatrical effects in merchandising.
   b. Advertising attention.
   c. Color contrasts.
2. Psychological effect.
   a. Warmth.
   b. Coolness, etc.

Initial selling trends of fluorescent leaned toward selling this new light short-on the basis of savings in the cost of light. This has proved a short sighted policy as well as a false promise. It is short sighted because it does not give the customer the true advantage of fluorescent. It is false because it does not consider all items of costs. The costs of lighting may be divided into three divisions:

The cost of electricity.
The cost of lamp replacement and maintenance.
The cost of ownership of equipment.

The cost of electricity represents a smaller portion here because of the very low rates in this territory. The cost of lamp replacement is an important factor and must be considered in any comparison. Maintenance cost except for cleaning has been a small factor in incandescent. However, initial experience would indicate that it is more important in fluorescent. The cost of ownership is also important, consisting of interest on investment, insurance, taxes, and depreciation. Most concerns figure this cost at not less than 20 per cent and many at 25 per cent.

Other conditions equal, the cost of lighting with fluorescent is no cheaper than with incandescent. Cost of electricity is usually reduced. Cost of lamp replacements, maintenance and ownership is increased. The difference is usually small, and the important factor is which source is best adapted to the lighting job.

Fluorescent Lighting Objectives

For many years the lighting industry has been retarded by an attitude of minimums. The prevailing approach to a lighting problem is—what is the minimum we can get by with. The advent of fluorescent with its high efficiency provides an opportunity to think in terms of objectives rather than minimums. Since efficiencies are approximately double our present incandescent, it seems reasonable that our footcandle standards should be doubled. The following pages show the need for such an objective standard of footcandles, the consumer advantage of objective footcandles and economic justification.

Fluorescent Experience

By J. F. EMERY
Idaho Power Co.

THE principal load of Idaho Power Co. is residential and small commercial. We never felt that we had a power factor problem. A few years ago, a representative from our company attended an Eastern meeting and came home with a rather black picture about the effect fluorescent lighting would have on our power factor. It was said that the power factor of fluorescent installations would not exceed 50 per cent. We installed reactive and kva. metering in substations to see if we were developing a bad trend in power factor.

The first big fluorescent job that came on was in a store wanting 3-phase service. This customer was going to install corrected tubes and this presented no problem. Later another

store came on with fluorescent lighting without corrective equipment, and we developed our own kva. meter to test this installation which showed a 60 per cent power factor. About that time the sales department got busy and began to sell corrective equipment to the customers.

We do not now believe the fluorescent problem is serious from a power factor standpoint. Generally the customer has considerable other load in incandescent lighting, and this gives him a pretty good over-all power factor, even if his fluorescent equipment is not corrected.

Highway Lights In Portland

By F. H. MURPHY
Portland General Electric Co.

The lighting on Interstate Ave., Portland, was installed during the summer of 1939 with funds provided jointly by the Oregon State Highway Dept. and the Federal Bureau of Roads. Since the street lies wholly within the city limits of Portland, the maintenance of the lighting system is paid for by the city.

It is my understanding that the method of financing the installation of this lighting system does not constitute a precedent for other streets but was done in this case to enable the department to get some valuable information about this type of highway lighting.

The system consists of two types of incandescent lighting units. On the south half of the system, 121 of General Electric Co.'s Form 86, helmet-type units with T-20 bi-post lamps are used; while on the north half, 120 General Electric Form 79-R units, with C-Sym-Etric refractors and standard PS-35 lamps are used.

The system consists of three 6.6-amp., series circuits, and all lamps are of the 4,000-lumen, 6.6-amp. type.

The system is about 3.2 mi. long, and the average spacing of the lighting units is approximately 141 ft. on each side of the street. In general, a staggered arrangement is used, which means that a lighting unit is located about every 75 ft. along the highway.

The units are mounted singly on 16-ft. mast arms attached to tubular-steel poles, which are placed just inside the curb, along that portion of the highway that is now full width. Where the street is not full width at this time, the poles are set back so they will not be disturbed by widening.

The light center is 30 ft. 6 in. above the roadway, and the lights extend out beyond the parking lane on the full-width street.

The illumination of the entire street averages about 0.35 ft.-candles, being 0.406 under the Form 86 units and 0.299 under the Form 79-R units.

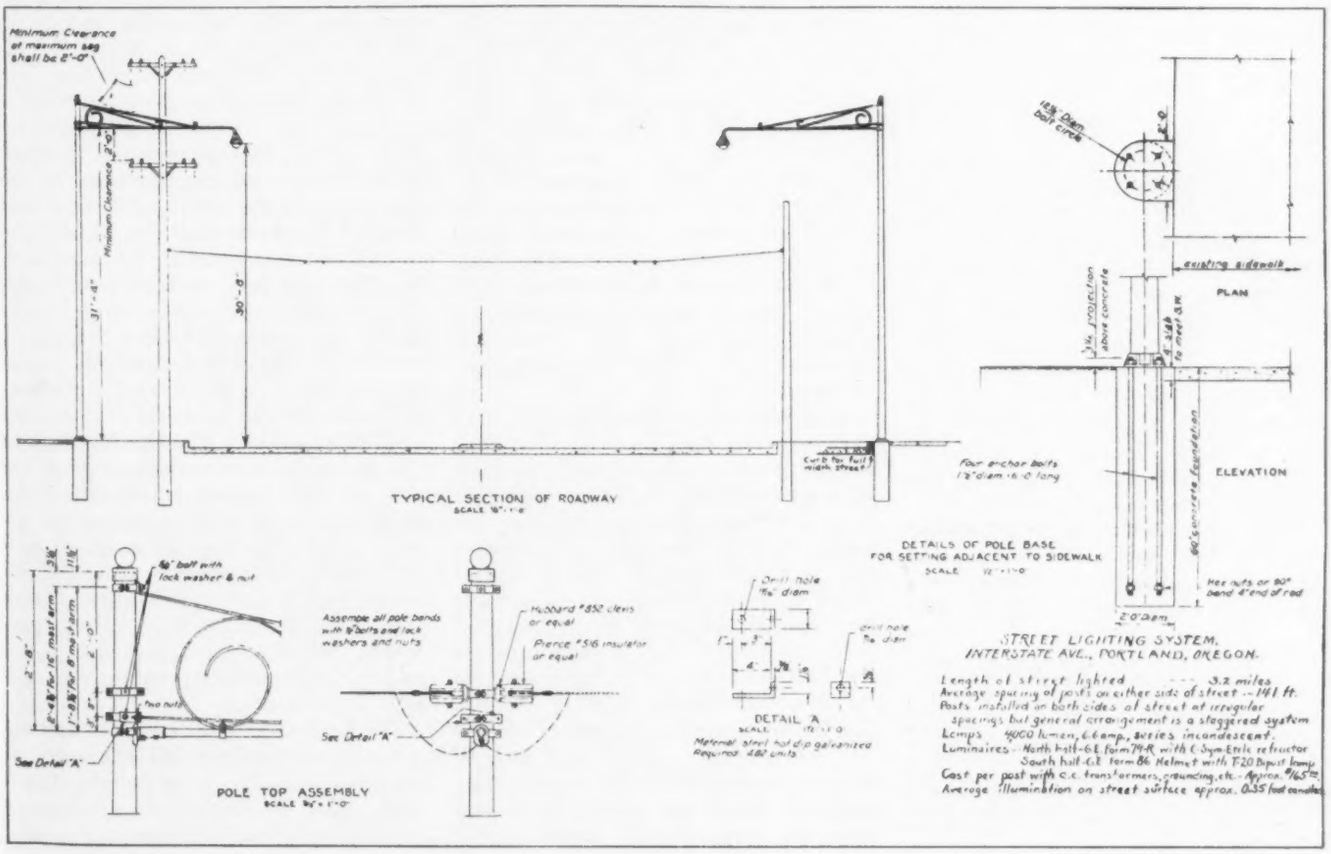
Up to this time, there has been no breakage of the Form 79-R, which is the spun-on type, and naturally none of the Form 86.

Drivers on this street are well pleased with this system of lighting even under fog conditions and the traffic has increased about 50% since the installation was completed about November 1, 1939.

Discussion

PAUL L. MARBLE commented on Murphy's report citing portions of the paper he delivered at last year's meeting entitled "Proof of the Pudding," published in the June 1940 Electrical West, page 117. He stated that certain sodium vapor highway lighting installations in western Washington that were projected last year were now in operation. These are the lighting of the Lake Washington in Seattle and the twin-born highway tunnel under Mt. Baker ridge.

The sodium vapor installation on the Narrows suspension bridge at Tacoma was, of course, destroyed in the failure of that bridge last winter. No new highway lighting installations of consequence have been made in the Puget Sound territory.


Minimum Clearance at maximum sag shall be 21'-0"
TYPICAL SECTION OF ROADWAY
POLE TOP ASSEMBLY
DETAIL 'A'
DETAILS OF POLE BASE FOR SETTING ADJACENT TO SIDEWALK
PLAN
ELEVATION
STREET LIGHTING SYSTEM, INTERSTATE AVE., PORTLAND, OREGON.
Length of street lighted ..... 3.2 miles
Average spacing of posts on either side of street — 141 ft.
Posts installed on both sides of street at irregular spacings but general arrangement is a staggered system
Lamps 4000 lumen, 6.6 amp., series, incandescent.
Luminaires — North half-G.E. Form 79-R with C-Sym-Etric refractor
South half-G.E. Form 86 Helmet with T-20 Bipost lamp
Cost per post with c.c. transformers, grounding, etc. — Approx. $165.00
Average illumination on street surface approx. 0.35 foot candles

Utilization Committee—Devices*

Survey of Farm Use

By C. O. BUNNELL
Pacific Power & Light Co.

For the 12 months ending March 31, 1941, the gross income from farm customers of Pacific Power & Light Co. was $712,365, an increase of $59,778 over the similar period the year before. Part of this was due to adding two new operating properties with about 250 farm customers.

Despite the addition of new customers which have a constantly diluting influence on our average use, the per customer consumption is continually increasing. This, we believe, is due to our aggressive sales activity. The average use per rural customer at the end of November 1940 (the last available report) was 2,143 kwh. per year, as compared with 2,123 for the same period of the previous year.

To serve our 12,500 farm customers, 2,272 mi. of distribution lines have been built and maintained. These are scattered from the Pacific Ocean to the east boundaries of Oregon and Washington and from Bend, Prineville and Enterprise on the south to Yakima on the north. Some, 9,400 sq. mi. is within our service area, 5,500 sq. mi. of it uninhabited. It has been estimated that at least 85% of all farms in this area now have electric service.

From this you might conclude that our rural line extension problem has been practically solved. Such is not the case. Though we cut our estimates for 1941 to 300 new farm customers, the first three months of the current year show an addition of 93 which would indicate at least 450 for the year.

Our continued and rapid growth has been maintained all through the depression. This is undoubtedly due, in part, to public interest, but mainly to our constant program of education and progressing line extension policy.

Farm service is still in the pioneering stage. We have had to feel our way and yet aggressively sell farm customers on the wisdom of greater use. In the early twenties, rural extensions were figured on a 2 to 1 basis. That is, for every dollar of estimated annual revenue, the company agreed to invest $2 toward construction of the line. This was soon changed to 3 to 1. In 1936 the policy was further liberalized to 4 to 1.

In the earlier stages, all cost above the free investment was absorbed on an advance-revenue payment to be made by the customer and figured on a five-year basis. This has now been liberalized to include the option of a guaranteed annual-revenue contract, wherein the customer agrees to pay for a certain stipulated amount of service during each calendar year, the term of such contract to run for a five-year period. It is assumed that, with proper sales effort on the part of our commercial department, the customer will have built up his use by the end of the contract period to the point where the line will be at least self-supporting.

Constantly lowering rates, characteristic of the Northwest, coupled with the promotional structure of same, have materially assisted in bringing about wide use of electric service on the farm as elsewhere. Analysis of the 1940 accounts of certain large-use farm customers in the Wenas valley near Yakima show over-all costs for all services including irrigation and water heating as low as 1.3c per kwh. The system over-all average for residential service at the close of 1940 had dropped to 2.51c per kwh.

Constant change in design and standards of rural line construction has gone hand in hand. While the present standard for rural line construction consists of 35-ft. creosote butt-treated cedar poles, fir crossarms, standard pin-type insulators, standard hardware, etc., with ground guys attached to channel iron anchors, experiments have been and are being made with various other types of construction.

A special type of long-span construction has been used in a few locations where customers are scattered, the over-all loads relatively light and possibilities of further extension of lines remote. On these lines standard construction is used except for the conductor which is composed of a high strength stranded combination of copperweld steel and copper wires. Carrying capacity has been generally equivalent to No. 8 copper for the primary and No. 6 for the secondaries. Span lengths will average 425 to 475 ft. with a maximum of about 550 ft. A heavier than standard grade of guying is found necessary to compensate for the heavier strain on the conductors. Trial installations have been made of special rural-type transformers having cover-type bushings and service pull-off racks.

A few lines have been constructed on REA design. This is the side-bracket, sky-pin type with grounded neutral, using strain insulators at heavy angles and crossarms at road crossings, etc., only. Poles are 30-ft. cedar, 4-in. top, with treated butts. It is not anticipated that such a type could ever become widely used, but might meet a need where but one or two customers are involved on an extension which would otherwise be beyond economic reach. However, new developments are appearing constantly. The things we thought impossible yesterday are accepted practice today. This cheaper type of construction may prove more practical than we expect. It will certainly cut the cost of line extensions where it can be used. Upkeep and repair are other matters.

The rural service department of our company came into being under the direction of D. B. Leonard in 1929. At that time there were approximately 6,800 farm customers. To handle the problems of this group 13 rural representatives were assigned to the new department. In 1939, due to increased number of customers and increased duties, the number of employees in this department was increased to 22 and wherever possible were moved out into the center of their assigned territory.

Up to this time there had been no direct selling except for a few items of special farm equipment handled by the company. In the spring of 1941 it was decided that an attempt should be made to have these boys do an all-round selling job—not just on farm equipment, but on domestic appliances as well. Their number was therefore increased to 26 with the added part-time assistance of seven or eight regular residential salesmen. In addition to saleswork and other duties which he has had in the past, the rural salesman now has the responsibility of handling all the work on line extensions except the actual engineering. He will maqe all contacts with the customer, estimate his needs and figure possibilities, secure signatures to contracts, collect payments, help him plan his wiring and assist him in selecting equipment suitable to his needs.

We have about 920 irrigation customers who use roughly $25,000 worth of service during the peak month of August. With the advent of sprinkler irrigation this load promises to increase

*J. E. Yates, Pacific Power & Light Co., chairman. B. C. Electric Railway Co., E. E. Walker; The California Oregon Power Co., R. S. Daniels; Eastern Oregon Light & Power Co., O. D. Lanning; Idaho Power Co., Orland C. Mayer; Mountain States Power Co., Geo. McClellan; Northwestern Electric Co., Corbett McLean; Portland General Electric Co., A. H. Greisser; Puget Sound Power & Light Co., C. S. Alger; Utah Power & Light Co., A. C. Keim; The Washington Water Power Co., H. C. Bender; West Coast Power Co., Henry Berk.

rapidly. There are at present more than 300 acres under sprinklers in the Walla Walla district with prospects for a 20% increase this year. This development is new on our system and is presenting some new engineering problems.

Scattered over our widespread system are upwards of 1,000 dairy customers with their varied problems of sanitation, feed grinding, water systems, fly extermination, stock water warming, lighting and ventilation to be handled and which are being handled more and more completely through the use of electricity. In addition we have more than 800 fruit farmers, upwards of 250 of whom have electrically-operated spray equipment with installed capacity of from 3 to 30 hp. A considerable number of them have their own packing and storage plants. There are over 500 poultry and turkey farms with connected loads ranging up to 25 kw., more than 300 stock farms, more than 500 truck farms and more than 800 farms with specialty crops such as asparagus, strawberries, grapes, hops, peas, hay, grain, etc., all of which use ever-increasing quantities of service. As a matter of fact the majority of this latter group are just beginning to realize the service that electricity can render.

Here are some examples of outstanding usage.

Last week I visited a gladiolus garden near Wapato, Wash., where a lady gardener had twelve 125-ft. double rows of glads growing over 1,500 ft. of hotbed cable, a load of 9.6 kw. The glads over the cable were more than 12 in. high. Those in check rows alongside were just coming through the ground. Both were planted the same day and were of the same variety. In spite of a 50% failure last year because of inferior stock, the lady claimed a net profit of $300.50. The plot measured about 1/10 of an acre. She also has a bug trap, which consists of a wash tub about 2 ft. above the ground full of water, with a scum of oil over the top and with a 15-watt lamp for attraction. She uses this to catch moths and claims to have completely cleared her ten-acre farm of cut-worms.

While Leonard was with this department, he developed an electric-steam sterilizer for dairy use, which has added many kilowatts to our lines and has saved many dollars for the dairyman. The department continues to develop new ideas and to sell the use of those developed by others.

Two years ago in the Dayton area we developed a pig brooder. There are now more than 60 of these in use in the Dayton area alone. They average little more than $2 revenue each per year, but the total adds up and they are a real service to the farmer. During the past year the State College at Pullman has developed a successful lamb brooder using the same idea.

Through the Committee on the Relation of Electricity to Agriculture we work constantly with the Washington State College, the Oregon State College and the University of Idaho. A great proportion of the uses and practices now in vogue on our farms are based on work done in collaboration with these institutions.

At present experiments are being carried on in poultry brooding, farm refrigeration, laying-house lighting, poultry-house ventilation, codling-moth control by use of lights, the use of ultraviolet lights for the production of vitamin D, drying of hay, hops, fruit and vegetables through the use of heat lamps, preservation and curing of meats by use of germicidal lamps, and other experiments too numerous to mention, but all to make electricity more useful and economical for the farmer.

It would seem to me that if our program is to succeed, rural lines will have to be designed in most cases for heavier duty rather than in an attempt to find the cheapest way of reaching the farm customer. After all, experience teaches us that the most friendly and best satisfied farm customer is the big user.

Analysis of Load Growth

By HENRY BERK
West Coast Power Co.

The privately-owned electric utilities in the Pacific Northwest have, in general, experienced an increase of load on their systems for the past five years. The effect of this increased load on system peak load, average cost per kwh., kwh. sales for the various classes of service, and some other related factors has been obtained from the major electric utilities in this area (including the B. C. Electric Railway Co.) and is presented in composite. These figures are compiled from statistics supplied by nine companies, which it is estimated represent 80% of the total electric service by privately-owned companies in the area.

System Peak Loads

The system peak loads for these companies have been totaled and treated as if all peak loads had occurred simultaneously. This result is plotted as Fig. 1.

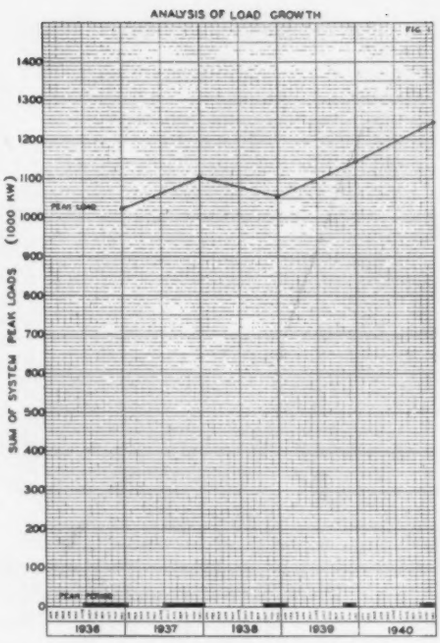


Fig. 1

The period during which peak loads occured for the companies serving areas mainly west of the Cascade Mountains varied from 65 days in 1936 to 7 days in 1940. Peak load period for the systems serving mainly east of the Cascade Mountains varied from 190 days in 1936 to 56 days in 1940. These latter periods during which peak loads occurred with only two exceptions (1936 and 1937) completely overlapped the peak load periods of the companies serving mainly west of the Mountains.

The system peak load and average annual load factor apparently are closely interrelated and follow the general trend of the industrial kw.-hr. sales. The short duration of the peak-load period indicates that probably for a major portion of the year additional load could be advantageously handled. Off-peak rates and special off-peak discounts will stimulate and encourage customers to use service at other than peak load periods and develop some of this additional load. Development of new processes for present industries and encouragement of industries having major requirements for electric energy during the hours of the day when energy requirements for other industries and commercial concerns are at a minimum will add load, make additional rate reductions possible, improve yearly load factor and reduce investment of the electrical industry in generation facilities for peak load requirements to a minimum.

In the following statements regarding rate reductions and reduced operating expenses full consideration must be

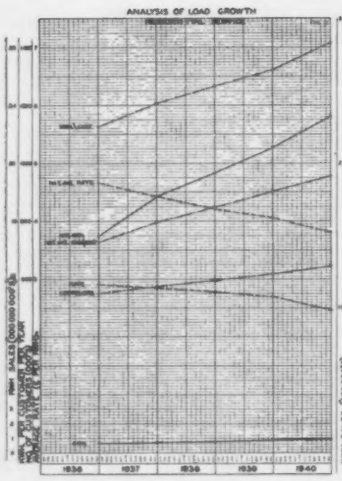


Fig. 2

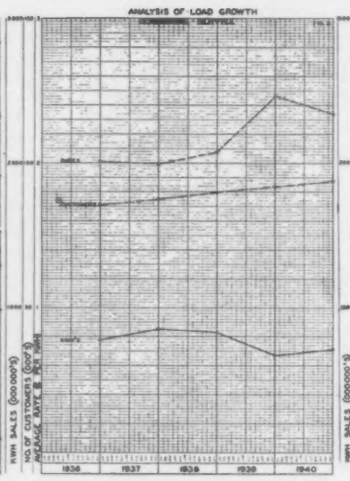


Fig. 3

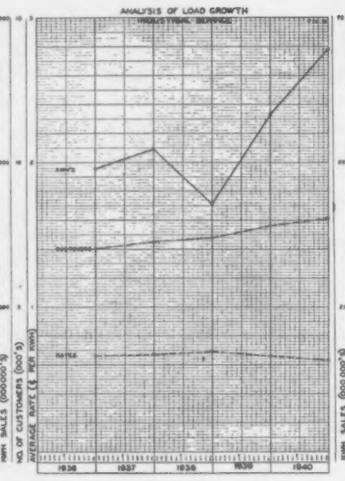


Fig. 4

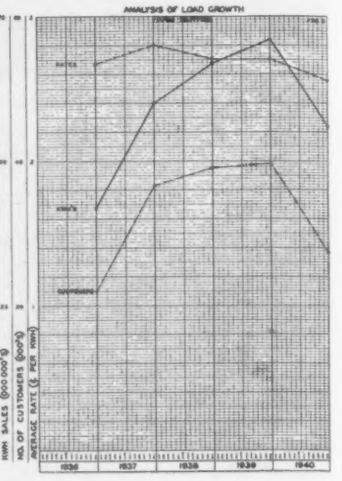


Fig. 5

given to the substantial increase of taxes. Taxes have increased during each successive year of this five-year period.

Residential Service

Rates, number of customers, and kwh. sales plotted in Fig. 2 include statistics for many rural customers, as three of the nine companies classified all rural or farm service as residential. The total residential service sales represent approximately 20% of the total kwh. sales.

Residential customers and kwh. sales to them show a uniform increase of 17½% and 50% respectively over the period (1936 to 1940 inclusive) while reduced operating costs and more efficient management enabled power companies to reduce average rates for this class of service by more than 15%. This service may be expected to increase through: numerous new appliances, being developed and marketed, sales efforts to increase saturation of numerous appliances among existing customers, increased use of electric water heating, further rate reductions, improved public relations, etc.; and future energy sales may be expected to show an increased percentage of the total sales of the industry.

Commercial Service

The apparent increase in average rate per kwh. in 1939 (Fig. 3) is due mainly to one large company's segregating industrial and commercial customers which for the three previous years had been classified as commercial. The number of customers reclassified was a small percentage and hence has practically no effect on the total number of customers. Increased sales efforts and reduction of rates so increased sales to commercial customers that by the end of 1940 kwh. sales had increased over those of 1939 by an amount almost equal to the total number of kwh. transferred to industrial service by reclassification. The kwh. sales for this service represent about 20% of the total.

Commercial service has apparently increased during the period (1936 to 1940 inclusive). The customers have varied, chiefly due to reclassification, but rates and sales, except for effect of reclassification, have remained practically constant, possibly due to addition of marginal new customers and types of demand rate schedules applicable to this service. This service has added load and future growth will depend upon special industrial and general development of this area and the stimulation which will be received from sales efforts by the companies, new types of, and reduced rates.

Industrial Service

Kilowatt hour sales for industrial service represent approximately 58% of the total kwh. sales (see Fig. 4). The unusual increase of customers in 1939 is partly a result of the reclassification referred to in the above paragraph, while the kwh. sales for the five-year period show a large increase, which resulted generally from expansion and promotional sales work.

Industrial service has been the chief source of increased load as the kwh. sales in 1940 were 41.8% higher than in 1936. Each year of this period, except for one during which the tempo of business activity was slightly reduced, energy sales increased over the preceding year, while the customers and average rate over this period remained practically constant. Many industrial rates are now based on off-peak service, and new industrial loads, further expansion of present facilitities, application of new mechanized production methods and increased output will increase the load and use of electrical energy for this class of service.

Farm Service

Farm service (Fig. 5) is classified separately by only six of the nine companies reporting and some of these companies may have the same rate schedules for farm customers as for residential customers in urban or suburban areas. The trend of the customer curve for 1940 is due to information not being available from one company which in 1939 reported over 15,000 farm customers or about 38% of the total farm customers reported for that year. If we assume that this company was serving 15,000 or more farm customers at the end of 1940 with corresponding sales, farm service representing almost 2% of the total kwh. sales, has experienced a greater percentage of increase of both sales and customers than any other class of service.

The increase of farm service has been uniform during this period and kwh. sales increased 75%, the number of customers 23%. Many of these additional customers were on newly constructed lines in sparsely populated or newly developing communities, where in numerous cases high guaranteed minimum revenues were required to make line extensions feasible to marginal customers. The high guaranteed minimum revenues for customers using only a few kilowatt hours normally tend to increase the average cost per kwh., but by sales efforts, reduced operating costs and stimulation of development in new communities the utilities have been able, in spite of the numerous marginal customers, to reduce average rates by more than 4%.

Miles of Rural Lines Constructed

The rural line extensions (Fig. 6) vary from year to year, depending on

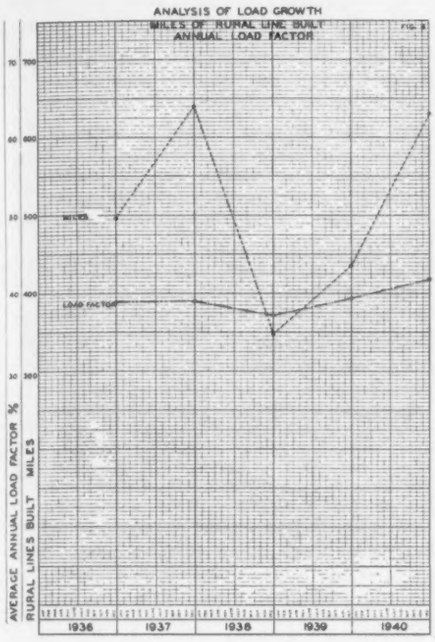


Fig. 6

business conditions, prices received by farmers for their crops and other related economic conditions. The construction of new roads, opening of forest areas for settlement, decentralization of industries, reduction of rates, promotional sales work, more liberal line extension rules, and reduction of construction costs are other factors directly affecting the miles of rural line extensions. The trend shown for 1939 and 1940 indicates sales and educational efforts by the various companies, which also accounts for the increase of farm customers during this period.

The total number of miles of rural lines constructed yearly has varied considerably during this period, being almost identical in 1937 and 1940. The construction of rural lines is desirable as farm service has shown a large percentage of increase in kilowatt hour sales and new customers make an ever-expanding market for appliances which increase kilowatt hour sales.

Average Annual Load Factor

The average annual load factor (also in Fig. 6) remained practically constant during this period (1939 to 1940 inclusive) and shows an improvement for 1939 and 1940, which presumably resulted from general reduction of rates for all classes of service and increased output of industries for defense purposes.

Variations indicated by the graphs of composite statistics for the various classes of service should be considered as general rather than specific trends.

A certain amount of industrial growth during this period undoubtedly resulted from the replacement of other types of power with electric power and such replacements may be expected to continue at an accelerated rate in the future due to obsolescence, depletion of natural resources, wearing out of equipment of other existing sources of power, applicability of electric power to defense production, and other economic conditions.

Summary of 1940

The year 1940 shows the electric utilities here have experienced growth in all classes of service analyzed compared to 1939. Kilowatt hour sales to residential customers increased approximately 12% and the number of customers increased 4.3%. This increase of sales indicates increased sales to existing customers and these extend into the lower steps of the rates thus reducing the average rate per kwh., but even with this decreased return the utilities made a general residential rate reduction of 4.3%. The average rate for this area for 1940 for residential service is 2.47c per kwh. compared to the national average (E.E.I.) of 3.81c. Kilowatt hour use per customer is 1,417 for our area, while the national average is 952.

Commercial service for last year does not present a concise picture, chiefly due to reclassification in 1939. Resulting statistics show a 1.9% increase in customers and 6.75% in sales, and the numerous rate reductions among the electric companies lowered the average rate 6%.

The part which the electrical industry performs in the national defense emergency is largely reflected for 1940 in the radical increase of energy sales to industry. Customers increased only 2.9%, while energy sales exceeded those of 1939 by 19.3%. Average rates for industrial service vary with many factors and normal variation of operating conditions may conceal any reduction of rates for this class of service. The average rate per kwh. for 1940 is 4.5% lower than for 1939, but this decrease is possibly due to improved load factor as well as rate reductions.

If it is assumed that farm service for 1940 for the one company for which this information was not available is the same or greater than 1939, kwh. sales and customers increased 8.4% and 9% respectively, while general rate reductions caused a decline of 4.1% in the average rate.

Commercial and residential service represent approximately the same percentage of total kwh. sales and the average rates per kilowatt hour (2.34 and 2.47 respectively) do not differ greatly. Apparently the greatest revenue is derived from these two classes of service, representing approximately 40% of the total energy. Efforts to increase number of customers and kwh. sales are of extreme importance. Undoubtedly some stimulation of commercial and residential service will result from the present increased production program, but additional increasd revenue of a permanent nature which may be derived merits greater efforts to enlarge these services.

Discussion

PAUL P. ASHWORTH—Mr. Berk's paper indicates that there has been some improvement in company load factors during the past year and that the average is now around 40 per cent. Unless the increased loads we are taking on are watched, we may find these load factors coming down. There is a close relation between load factor and net, and if we can increase our load factors, we can get more net.

J. E. YATES—The question of how to control the point at which new load comes onto the system is particularly interesting to distribution engineers.

C. O. BUNNELL—There is a new low load factor load in the Yakima Valley in the form of a mechanical hop picker. This runs 25 hp. or more, and is operated only three or four weeks during the season. An unsatisfactory labor situation brought this about.

F. H. MURPHY—There is a trend in hop drying in the Willamette Valley designed to speed up this agricultural process. This means more load used a shorter time, thus creating a lower load factor.

R. S. DANIELS—There is little the companies can do to control load factor. If low load factor loads come during the off-peak season, they might be more valuable than some other higher load factor loads. This is true of the sawmill load in our territory, which is at its height in the spring, and tends to offset the irrigation load in the fall.

We had a dredge load that was a bad one. We put on a synchronous condenser.

Heating Dwellings Electrically

J. E. YATES, Chairman of Utilization Devices Subcommittee, introduced G. H. Bliesner of the Bonneville Administration who presented some of the material contained in "Heating Rural and Urban Dwellings with Elec-

trical Energy," which has been printed by the Bonneville Administration as Utilization Paper No. 5, April 16, 1941.

Bliesner reviewed some of the history of experiments in electric house heating and some of the tests made in this field, citing a number of installations in the Pacific Northwest, giving performance data and comparative cost data.

Discussion

JOHN BANKUS — An article in the March, 1941, issue of ELECTRICAL WEST gave the results of tests on distribution systems in Central Valley, Calif., where there is apparently considerable electric house heating installed. These tests showed the high consumption on the distribution systems was during the summer months when the irrigation load was on, while in the winter months, the load was low. Such a load characteristic sets up a favorable situation for house heating in the winter.

We made some tests on Portland General Electric Co.'s rural load in Washington, Yamhill, Marion and Clackamas Counties to see if our set-up would prove to be similar. We do not have as extensive an irrigation load, and this makes a decided difference. Our consumption for this rural area did not vary appreciably from month to month. If we superimpose a large heating load on our normal load in this area in the winter time, we will create a reduced load factor and have to increase the capacity of our distribution system.

J. C. PLANKINTON—Bliesner's paper refers to house heating in Tacoma. There used to be some 1,100 homes electrically heated in Tacoma. This number has been greatly reduced in recent years. I understand the reasons are that the City Light Department does not encourage this load now, and that much of this load has been lost through customer dissatisfaction.

C. WALTON LARUE—There is a good field for heating small houses in this territory, and there is an economic necessity for this type of heating. Installation costs are low and operating costs are quite reasonable if these small homes are properly insulated. Insulation is the key to the situation. When you use individual heaters in each room, there is a good diversity in this load. The companies ought to encourage this use of electric power in small homes properly built and properly insulated. In such cases, the costs, from the standpoint of the customer, are quite competitive with other forms of fuel.

Larue cited his own home in Oswego and described the heating installation there. This is reported on page 20 of the Bliesner-Bixby report.

R. S. DANIELS—The electric air heater is 100 per cent efficient, but heat losses are heavy unless the house is properly weather-stripped and insulated.

Power Production Committee*

Maintenance Coordination

By F. S. BEALE
Idaho Power Co.

A letter containing certain questions on maintenance was sent to eleven of the interconnected companies in the Northwest, and replies were obtained from nine. Hence the discussion presented here is a summation of the practices revealed by these replies, and where appropriate it also includes opinions as expressed. Distinctly this is not to be understood as a scheme with which to saddle anyone. It aims at a broad view of a subject which generally has concerned us only in a self-centered way up to now. But with interconnection as it now is, and as it might in the future become, some form of coordination, or at least cooperation might be found desirable in the matter of plant maintainence.

* E. H. Collins, The Washington Water Power Co., chairman. George E. Quinan, Puget Sound Power & Light Co., vice-chairman. B. C. Electric Railway Co., E. E. Carpenter; The California Oregon Power Co., Harry Olsen; Eastern Oregon Light & Power Co., J. K. Moore; Idaho Power Co., H. L. Senger; Mountain States Power Co., George McClellan; Northwestern Electric Co., O. L. LeFever; Pacific Power & Light Co., D. R. McClung, J. H. Siegfried; Portland General Electric Co., Walter Brenton, W. E. Briggs; Puget Sound Power & Light Co., A. P. Newberry, H. H. Waldorf; Utah Power & Light Co., B. E. Gordon, E. M. Naughton; The Washington Water Power Co., M. L. Blair, W. A. Hill, J. S. McNair, John Tobyn.

The Questions

1. How often should waterwheels be inspected for runner clearance, cavitation, etc.?
2. How often should generators be inspected, and to what extent physically and electrically?
3. How often should governors be inspected or overhauled?
4. How about cleaning bearings, and to what extent should the work be carried out?
5. What work must be done on gates, valves, etc., and how often?
6. What is your opinion in regard to coordination of maintenance work in the interconnected system, its practicability and desirability?

Waterwheels

It is agreed that waterwheel maintenance work must be carried out in careful recognition of the individual characteristics of each installation. So many factors enter into waterwheel operation which directly affect the length of the period between shut-downs that it is apparently impossible to stipulate that they shall be made at the end of any given single period. A waterwheel may have to be shut down because the water carries large quantities of abrasive material which cannot be excluded from a water-lubricated bearing, and which may govern the length of time between the shutdowns. In another instance because of draft tube as well as water conditions, cavitation may become the controlling factor. Some of the older horizontal waterwheel installations may require frequent attention to shaft alignment because of bearing conditions, even though not directly due to excessive amounts of abrasive material carried in the water, if water lubricated. And we find waterwheels operating for as much as three years without shutdown on their account.

Generators

Here, again, we find that maintenance work on, for instance, an open-type horizontal unit will require shutdowns because of accumulations of dust, insects, etc., which must be removed before the thermal and electrical characteristics are materially altered. Such shutdowns will occur with considerably greater frequency than for the totally enclosed generator in which air is re-circulated, the heat being disposed of by means of any form of heat exchanger, and in which vacuum scavenging devices are used to remove oil vapor which otherwise might settle upon windows and other parts.

In the former case shutdowns might occur twice per year, and in the latter case several years might pass before a shutdown became necessary for the purpose of generator maintenance.

It is also seen from the letters received that there is in many cases no systematic plan calling for periodic tests of generator electrical insulation. In one report the insulation in horizontal open-type generators is meggered

once per month, but four times per year is the schedule for totally enclosed generators. In another company electrical tests are made only upon suspicion due to circumstances which indicate the possible presence of moisture. Still another report indicated belief that electrical testing of the insulation of a high voltage generator—13 kv. in this instance—was more important and should be carried out oftener than in the case of the generator operating at lower voltages.

Again, an almost universal thought was expressed in the letters: Men on duty during normal operation could detect many minor maintenance items by careful observation and listening, and often correct them without waiting for a shutdown.

Governors

In the first place the amount and type of maintenance work to be performed on hydro governors will depend upon the type of operation of the unit controlled by any given governor. Where frequency control is the function from time to time, permissible tolerances are low, and maintenance of governors so used will be more frequent and entail more attention to the ultimate in performance. Such governors get more use, and the linkage systems with their attendant, numerous bearing surfaces therefore require more attention. However, from all indications it should generally be possible to do all necessary work on governors at a time when other general work requires a shutdown.

As in the case of generators, dusty surroundings will decrease the length of time between governor overhaul jobs, and this period is also affected by the type of speed-head, construction, and housing of the governor itself.

Bearings

Individual bearings generally demonstrate differences from each other. This makes it advisable to consider maintenance of each on the record of performance rather than upon an arbitrary schedule. Most operating men will agree that any bearing which is consistently the prime reason for a shutdown is a suitable subject for extended and perhaps intensive effort at improvement. It is, of course, not true in all cases that worthwhile improvement can be made, but it is thought that such cases are rare where the newer and larger capacity generating units are concerned. Hence, under average conditions, it may be said that bearings, of themselves, are not the prime reason for shutdowns, even though they may be included among the reasons which, when added together, are responsible for them.

Reports indicate a wide variation in the tactics used in bearing maintenance. In some places all bearings are rolled out, cleaned, adjusted if necessary, old oil drained, reservoirs cleaned, and new or filtered oil put in, for horizontal-type units. This routine is followed annually. In another instance the report states that bearings of the main units had been cleaned but once in nine years, and that the oil is filtered once every three years. However, several reports indicate that for important bearings, such as Kingsbury-type thrust bearings, samples of the oil are taken every three months. These samples are sent to a commercial testing laboratory, and until the resulting analysis shows sufficient depreciation of the oil, no change is contemplated, other than adding small quantities for make-up purposes, or to keep the viscosity and acidity numbers within designated limits.

Maintenance practices for bearings depend upon the method of lubrication, turbulence of the oil, adequate removal of moisture and other impurities collected, particularly when the bearing is exposed to untreated air, in more or less dusty surroundings. Methods of cooling, whether by large quantities of oil in a reservoir circulated or forced under pressure into the bearing, or by water through cooling-coils, or other means, also affect the problem. The viscosity of the oil used, as related to the load carried by the bearing and the clearance permitted, and adequate elimination of electrolysis, all have their effects in varying the length of time between necessary bearing maintenance operations.

Gates and Valves

Generally speaking, repairs and improvements can be made at the time other maintenance requirements have accumulated. Reports indicate a feeling that inspection of such equipment should be carried out at least once per year. They also indicate some variation in the length of time between the inspection periods, but this is probably due to the fact that most of such work is done at a time when a shutdown has been scheduled for other items as well. Only accident is likely to alter that scheme.

Maintenance Schedules

Only two replies made any direct comment upon the question of coordination of maintenance work among the companies interconnected. Both opinions were that such a program might prove worthy of consideration. It therefore appears that further discussion of the subject will be necessary in order to obtain a more representative statement.

A blanket maintenance schedule to apply to all hydro stations would be almost impossible without provision for unreasonable amounts of reserve capacity, and, rigidly applied, it would mean excessive maintenance costs for a majority of individual units. On the other hand, failure to consider those units presenting the most unfavorable maintenance records would soon result in serious damage to that particular equipment and prove very expensive.

Maintenance schedules are laid out with consideration for station personnel available, water conditions both as to flow and abrasive content, load and peak load conditions, and the many individual characteristics, some of which have just been mentioned.

Thus it becomes evident that to schedule maintenance work will require some sort of centralized clearing office. It might be necessary to file in it the maintenance history of each individual unit, or classify units into groups of differing frequency of maintenance work. Work to be done might then be scheduled by arrangement with such office, in which would rest the responsibility for maintaining adequate interconnected system capacity. Such a set-up would, of course, be complicated, but hardly more so than the work it would attempt to undertake.

An alternative was also suggested. Each of the interconnected companies can continue to operate much as in the past, regulating their maintenance activities in such a manner that failure of any tie line will not result in lack of adequate capacity for the load conditions in the isolated parts.

Discussion

O. L. LeFever—It would seem desirable to have a conference of operating men every year to coordinate the maintenance schedules of the companies on the interconnected grid so that we won't have too many big units down at any one time.

Water conditions generally determine when a plant can be shut down for maintenance. There is only one best time of the year for shutting down our Ariel plant, since there is only one unit installed there. Our Condit plant with two units gives us a little more leeway in time for maintenance work at that plant.

R. S. Daniels—We do our larger maintenance work such as runner welding on a definite schedule determined well in advance on the basis of the time of our lowest load. We carry out smaller jobs over week-ends. We do not have any very large generating units so that it does not make so very much difference to us when we take out one for a short period.

Paul P. Ashworth—To what extent

do the companies buy complete new cast steel water wheels for replacement rather than having new buckets made? I am speaking now of the older type Pelton wheel of from 1,000 to 1,500 kw. capacity. We have a steel foundry that can turn out these buckets at a reasonable price.

F. S. BEALE—We have had some wheels cast in bronze in Salt Lake City.

WALTER BRENTON — We do our maintenance on steam units in early spring when we have plenty of water and on hydro units in late summer when the water is low. In this way we do not sacrifice so much capacity. We carry out this work on a definite schedule so it will be coordinated with our load requirements. So far we have not coordinated this work with other companies, but we are coming to a point where this may be necessary, particularly during this coming summer.

G. C. SEARS—There is already coordination between some companies on line replacement work. Maybe there should be coordination on maintenance of generating units. How about the legal phases of having wheels cast instead of buying them from the manufacturer?

O. L. LEFEVER—The patents on most old wheels have run out along time ago.

PAUL P. ASHWORTH—We haven't yet got into trouble from this practice. We have a man who designs a slightly different runner than the original so we do not copy the manufacturers' runner exactly. Our designer claims his runner is better, and we expect to run an efficiency test to determine this.

F. M. LEWIS — At Bonneville, our maintenance is adjusted on the basis of opportunity and judgment rather than on a fixed set schedule. We have a card index system listing all pieces of equipment. We outline what is to be done at regular inspection periods such as what kind of oil and grease the equipment takes and when to change it, and items of this kind. A certain batch of cards are taken out of the file each week and given to maintenance men. This system is flexible. I am speaking now chiefly of motors and starters of which we have a great many on the project. If the machines do not need any work done on them when they are inspected, we bring up the cards for attention again in four to six weeks. As to the maintenance of our main units, this will depend on load conditions.

C. D. RANEY—We have had a maintenance schedule for about 15 years. It is based largely on previous records with the equipment under consideration. We inspect some equipment once a month. Later, if we find trouble does not develop that frequently, we change the schedule on the equipment to some other time period.

E. H. COLLINS asked for an expression from the companies present as to how many would like to see a committee set up to study a coordinated schedule of maintenance. Several favored this idea, and Mr. Collins agreed to look into the matter further.

Future of Steam In Northwest

By J. MacEWELL and P. D. JENNINGS
Puget Sound Power & Light Co.

WITH large quantities of hydro power being developed along the Columbia River and used profitably in the Pacific Northwest, engineers with steam-power experience are wondering how the steam plant will function in connection with a large supply of hydro energy. At the present time, the hydro power developed in the Northwest, which includes the states of Washington, Oregon, Idaho and Montana, is about 2,084,000 hp. which is 12% of the potential development of hydraulic power available 90% of the time. The total steam power developed in this area is about 547,444 hp. or 21% of the total power so far developed.

These figures for the Northwest may, at present, show steam power to be comparatively low, but if we go back 50 or 60 years we find the same comparison existed in the Middle and Atlantic States when hydro-mechanical power was the predominating source. These localities now use hydro power to supplement steam power that has become the basic source, and the combination has been found to lower the production cost.

We in the Northwest reverse this combination of hydro and steam power to that in the Middle and Atlantic States by using steam power to supplement hydro power during times of low water and for other reasons. Our combination also lowers production cost. This is in connection with plants along the west side of the Cascades where the reservoirs are small and depend on river water. The reservoirs are small because the topography of the region, due to its recent geological age, causes the slopes to be steep and the distance short from source to mouth, thus requiring a large outlay of capital to develop extensive storage sites. East of the Cascades large reservoirs have been developed readily by raising large lakes, thns putting off for the time being investment in steam plants.

Puget Sound Power & Light has a number of hydro plants on the west side of the Cascades, some with large and some with small reservoirs, also a development on the Columbia River in Central Washington. Only data from a combination like this can show the true value of steam-plant operation with respect to a large hydro-electric system; in other words, an existing example of what the future may hold for the Pacific Northwest after more interconnections are completed and full development of the hydro plants are made.

Figs. 1 and 2 show typical examples of the two most important uses of steam power in supplementing a major hydro system. These show examples typical of most of the large systems on the Pacific Coast, in which most of the load is carried by hydro, and steam is used to supplement hydro peak and energy deficiencies.

Fig. 1 shows the typical daily load curve in which the peak hydro-machine capacity is insufficient to carry the load. It is necessary to operate the steam plant on the peak. In this particular illustration, the peak hours are longer than usual because they show the operation of steam under breakdown conditions as well as peak requirements; that is, one of the hydro plants being out of commission. A more economical condition ordinarily is reflected where the hydro machine capacity on the curve is up to approximately the 210,000-kw. level and the steam peak operation does not exceed 7 or 8 hr.

Fig. 2 shows an example of steam operation in the fall of the year when the hydro plants have insufficient stream flow to operate at full load over the peak. The "run of the river" hydro plants must be operated with gates wide open to prevent wasting of water. Usually, due to light system load in the early morning hours, it is impossible to run steam without wasting water; therefore, the steam cannot operate at 100% load factor. In the illustration given in Fig. 2, the steam was operated at as high a load factor as possible and the hydro plants with storage facilities were used to take care of the peaks, an exact reversal of operation shown in Fig. 1.

Obviously, the use of steam as a substitute for hydro energy deficiency is economical up to the point where the fuel and operating costs of steam generation will approximately equal the fixed charges and operating expenses on additional prime hydro facilities. Thus, on power systems such as exist on the Pacific Coast, steam and hydro developments will usually come in cycles; first comes hydro, and then, as the load grows, it is supplemented by further additions to steam facilities. Then, as mentioned before, the time will arrive

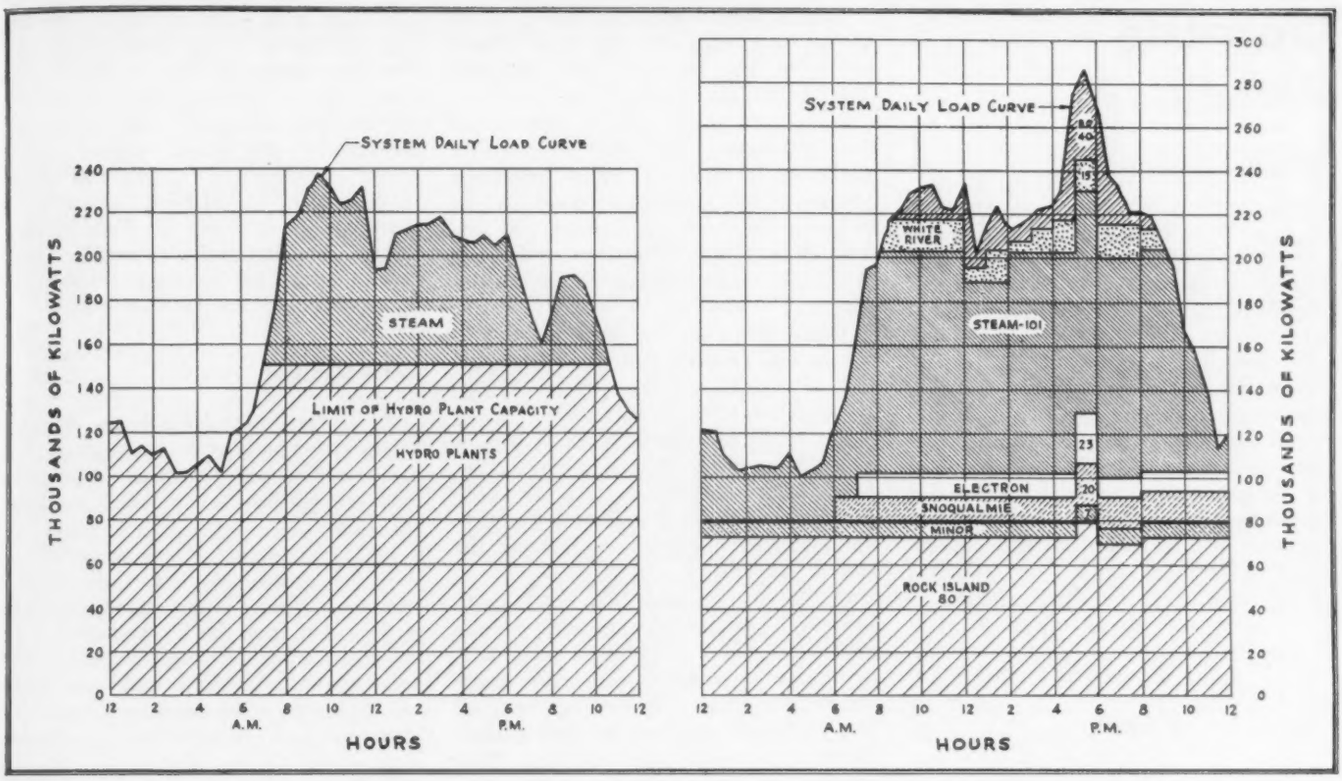


Fig. 1 Fig. 2

when further additions to prime hydro investments will be warranted and the cycle is repeated until economic hydro developments have been exhausted.

An additional use of the steam plant in this locality grows out of its ability to furnish synchronous-condenser capacity for power-factor correction. It happens that the steam plant is located in the more thickly populated centers where power-factor correction is most needed. When the generators are operated as synchronous condensers, they are generally disconnected from their turbines, but if not, a small amount of steam is fed to the turbine to keep it cool. This operation has been successful on units of 10,000-kw. and 35,000-kw. capacity.

Summary

A system having a combination of steam and hydro power is found to operate more economically than one having either 100% steam or hydro.

Investment costs for peak capacity are less for a steam installation than a hydraulic installation in the Pacific Northwest because of the great distances from the plants to the load centers. The cost to construct hydraulic units and their accompanying transmission lines is about twice the cost to build steam units near large cities. Thus, the economical system is to operate the hydraulic units at a high load factor and the steam units to supply peak energy.

On the other hand, steam operation may at times be at the 100% load factor when it supplements a number of small hydro units during times of insufficient stream flow or at times of breakdown of some larger hydraulic unit.

Because the steam plant is located near large load centers, the steam units become ideal for stabilizing heavy incoming loads on long transmission lines. Also, because of the proximity of the steam plant to load centers, the steam units can readily be converted into synchronous condensers, thus delaying investment costs in additional equipment.

As demand for power increases in the Pacific Northwest, the ultimate hydro capacity will be reached. However, while hydro capacity is increasing toward the ultimate, development of steam plants in the various communities will be advancing in cycles or steps that follow each step of hydro development. Each development of the steam units depends on periods demanding exceptional power increases and the possible lean water years from a diminishing rainfall of the region. Thus, we have in the future an ever-increasing steam-power system supplementing the hydro system until, as time goes on, steam power becomes equal and then eventually surpasses the hydro system.

Discussion

R. M. Wilson described with the use of the blackboard a system in use in The Washington Water Power Co. for charting plant operation by the use of load duration curves. Time is represented by horizontal distance, from zero per cent of the time on the left to 100 per cent of the time on the right. System load in mega-watts is represented vertically. We are trying to find what per cent of the time certain loads are in use and what constitutes normal load.

For instance, suppose at zero per cent of the time the total load is 200 megawatts. We then plot the load by time percentage intervals up to 100 per cent. At this point the load is, say, 50 megawatts, and we have a smooth downward curve that is steep on either side of the chart and fairly flat in the middle. These curves are plotted for one month intervals.

Then on this chart we can plot in the capacity output of our plants and determine how much the base load plants can supply and how much auxiliary we are going to need from steam or purchased power, and also how much peaking capacity will be needed. This also indicates how much dump power we have for sale, and if we can't sell it, we spill it.

Our system peak comes in July or August, particularly in dry years due to our irrigation load.

Operating Records

By J. D. ELLIS
Northwestern Electric Co.

IT appears we are now spending more time every month getting out our operating records; there is need for simplification. Since we are all reporting to the Federal Power Commission, we have to follow their standard, and it is important that we be consistent. Uniformity of reporting among the different companies would also be advantageous. If we are keeping other records beside those required by the FPC, we should discontinue this where possible in order to avoid keeping two sets of records. The government wants our report by calendar month instead of by fiscal month.

All basic records should be kept at the source, and only supplementary records in other departments. All operating records and reports should be cleared through one department to avoid giving out conflicting data, and also to concentrate the files in one spot.

Sometimes we start a new report for some particular purpose which is important at that time. Later the importance of such data may diminish or disappear, in which case we should eliminate this report. There should be a periodic examination of the records we are keeping to see if there are any that we do not need.

In the Northwestern Electric Co. we keep a card index on each report, showing what the report covers and the date the report is completed.

Sometimes different departments of the FPC request data that are already available in the FPC office from our reports. We might ask them to coordinate their requests through one central office to see if the data needed are available before asking for a special report.

There is room for improvement in our record keeping and reporting. Perhaps it would be a good idea to set up a committee to study this general problem. (Ellis introduced J. M. Voorhies of his company to explain the operating records.) Voorhies showed the daily log sheets from each station and a large daily summary sheet consolidating the station records.

One very important item we have to keep is the record of what energy flows across state lines. The large daily summary sheets are referred to many times during the year. They show the total kw. generated by stations and broken down by districts; received from other companies; delivered to stations; and from this we get the net generated and received.

The monthly power report was shown which shows on the first page, the net generation; that received from other companies, giving the total output; the delivery of power to other companies; the net output and received; kw.-hr. billed to customers by districts; the losses and company uses; the energy transferred across state lines. On the other pages of the report are tabulated power received by districts and delivered by districts, which gives the transmission and transformation losses; power delivered to feeders and billed to customers by district, which gives the distribution losses by district; then the transmission and distribution losses are added to the generating losses on the first page to get the total losses.

Discussion

P. D. JENNINGS—We have tried to get hourly readings at our stations but find that the large constants on meters make it difficult to get such readings accurately.

J. M. VOORHIES—Over a period of time the errors in such readings balance each other. Our regular employes at the plant keep the log and send it to the main office for compiling into the daily report. We have had some trouble with operators sending wrong information and errors in totalling feeder load across the log sheet.

E. H. COLLINS—There is enough time reserve in station operation to permit operators to keep these records and save cost in the general office. It is essential, however, to let the operators know what you want with these records, then you will find they will cooperate. This whole problem resolves itself into the question, aren't we sending too many records in to headquarters?

Transmission and Distribution Committee*

Lightning Protection

A study of Northwest practices on distribution transformers

By A. B. OLSON
Eastern Oregon Light & Power Co.

PRESENT-DAY consumer requirements of service continuity have increased utility companies' interests in reducing outages. Lightning is of major importance in some locations as a cause of outages by either damaging the distribution transformers or causing blown fuses.

The protection of consumer service is of fundamental importance. In general, lightning protection is justifiable when the carrying charge on the protective equipment does not greatly exceed the cost of replacing damaged apparatus, plus the evaluation of the service interruption to the consumers.

It is difficult to assign a proper value to a service interruption. In analyzing the cost of an outage, several items must be considered, among which are the number and type of customers affected, cost of restoring service by refusing or replacing transformers in isolated areas, and the cost of making repairs. The relations of the utility with its customers are also dependent on the continuity of service. In some cases, the loss of revenue might also be given consideration.

The purpose of this paper is to review the practices of lightning protection of distribution transformers followed by utilities in the Northwest.

To secure the necessary data, a questionnaire on the practices and results of lightning protection of distribution transformers was sent to member companies. Reports were received from eleven of the fourteen companies contacted.

Six companies operating along the Coastal section reported that no protection is used. Their records indicate very few outages because of transformer failures or blown fuses. These

* R. J. Davidson, Pacific Power & Light Co., chairman. L. R. Gamble, The Washington Water Power Co., vice-chairman. Allis Chalmers Manufacturing Co., C. T. Hurd; B. C. Electric Railway Co., P. C. Gill; The California Oregon Power Co., R. S. Daniels; Eastern Oregon Light & Power Co., A. B. Olson; General Cable Corp., W. E. Wallace; General Electric Co., C. E. Canada; Graybar Electric Co., E. J. DesCamp; Idaho Power Co., J. F. Emery; Mountain States Power Co., Walter Smith; Northwestern Electric Co., D. A. Hord, Corbett McLean; Oregon State College, F. O. McMillan; Pacific Electric Manufacturing Corp., C. H. Cutter; Pacific Power & Light Co., A. E. Bond; Portland General Electric Co., W. E. Enns, H. R. Wakeman; Puget Sound Power & Light Co., E. R. Nigh; Telluride Power Co., L. R. Fournier; Thos. S. Wood Co., T. S. Wood; Utah Power & Light Co., G. W. Westcott; The Washington Water Power Co., Earl Baughn; West Coast Power Co., Henry Berk; Westinghouse Electric & Manufacturing Co., M. P. Buswell.

companies experience from one to six lightning storms per year.

One of these companies, however, is in the process of compiling data on all breakdowns to determine how far they can afford to go in protecting transformers against lightning.

Washington Water Power Co. reported that it had used a number of lightning protection gaps, but discontinued their use after two years' experience proved that the cost of providing this means of protection was not justified. The practice of grounding all transformer tanks and secondary neutrals to the same ground rod is followed. Where practicable the secondary neutrals are interconnected, and a common neutral ground is employed where the supply transformers are "Y" connected and the primary line has a neutral conductor.

The records of this company indicate improved operating results from grounding the transformer tanks from the standpoint of damaged transformers and number of blown fuses. Ground resistances are checked at least once every three years and are required to be 25 ohms or less.

Approximately 158 of the 6,900-13,200-volt class and 29 in the 2,300-volt class are of the completely surge-proof type. These transformers were purchased several years ago to obtain operating experience.

Pacific Power & Light Co., with very few exceptions, does not provide any lightning protection for distribution transformers. Its records indicate that failures due to lightning (without protection) do not justify the cost of protective equipment.

This company also follows the practice of grounding the cases of transformers, primary neutrals of multi-grounded "Y" circuits, and secondary neutrals both at the transformers and ends of secondary circuits exceeding 300 ft. in length. Ground resistances are tested when installed and efforts are made to obtain maximum resistances of 3 ohms on water-pipe grounds and 25 ohms on artificial grounds.

Surge-Proof Transformers

An appreciable number of installations have been made of the surge-proof transformers, which are similar to the completely surge-proof except that arresters or gaps are omitted. Operating experience with this type has been very satisfactory, with no operation of the internal circuit breakers during lightning storms, whereas adjacent conventional-type transformers frequently have had their primary fuses blown.

On the Idaho Power Co. lines, the use of lightning arresters was discontinued approximately 10 years ago. Studies indicated that their use was not warranted. This company reported a program, nearing completion, of converting their uni-grounded neutral lines to a solidly grounded common-neutral system. During the conversion period, ground resistances were measured for general information. After completion of this interconnection, it is anticipated that the ground resistances will be so low, and that there will be so many grounds tied together that any further ground tests will not be necessary.

Limited use has been made of surge-proof transformers by the installation of 90 units in an isolated area subjected to severe lightning disturbances.

Idaho Power Co. also reported the application of coordinated fusing to approximately 500 mi. of rural line in progress at the present time. In connection with this scheme, double spill-gaps are installed and connected directly to the line at each transformer location. The gaps protect the transformer from lightning surges and prevent the blowing of the transformer fuses. These fuses are accurately coordinated with the substation breaker so that only the permanently faulted section of line is taken out when trouble occurs. It is not anticipated that the double spill-gaps will clear themselves at such times as they flash-over from lightning disturbances. Clearing will be accomplished by the operation of the substation breaker.

West Coast Power Co., operating smaller distribution systems in various locations, reported the recent installation of de-ion gaps on a number of their larger distribution transformers. This provides protection in addition to the arresters installed at the substation, which usually supply comparatively short feeders.

Recent transformer purchases have been of the surge-proof type. Approximately 750 of these units are in service varying in size from 1½ to 75 kva. Operating results have been very satisfactory and have materially reduced lightning losses. This company also reported several trial installations of de-ion gap transformers on long lines by interspersing them with four conventional-type transformers having no lightning protection. The operating period is too short for reporting any results of this type of installation. This company reported an estimated number of 60 lightning storms per year, with 20 failures in 3,750 transformers, 600 of which were provided with protection.

Eastern Oregon Light & Power Co. has followed the practice of installing arresters in exposed areas prior to the development of the surge-proof transformers. In the past several years, over 50% of the transformers on new rural lines have been of the completely surge-proof or surge-proof type. We have also installed a number of surge-proof units on exposed lines, interspersed with several conventional types with greatly improved operating results.

In our territory, we have 15 to 20 storms per year.

On smaller systems, such as the West Coast Power Co. and our company, the loss of a few units during a lightning storm naturally has greater significance than on systems using several times as many transformers.

Practically all of the member companies reported the use of protective equipment on lines at the distribution substation and at the terminals of underground and submarine cable.

As expected, there is a wide variation in the practices followed in distribution transformer protection, which emphasizes the necessity of each company's maintaining outage records for its own particular use.

The use of either surge-proof or completely surge-proof transformers offers a method of decreasing the number of lightning outages in areas having severe storm exposures.

From the above data, no general statement can be made regarding recommendations of protecting distribution transformers, but operating experiences indicate the desirability of protective equipment in selected areas, and under certain operating conditions.

It is hoped that the results of this investigation as reported may serve as an incentive for future progress reports of studies into the economics of providing or omitting lightning protection.

Discussion

H. M. Jones—We have used the Mathews Protectograp, but have not had a full season's experience on it as yet. We have had experience on the Carney triple-link gap, having a combination fuse and gap. We have bird trouble with these and had to disconnect the ground. We are going to try putting a bird guard on the helix springs, a sharp pointed guard that birds do not like to light on. We are going to spill gaps on the line side of our transformer cut-outs. Lightning damage to our transformers didn't warrant $14 or $15 protection, but we lost a lot of fuses and this became expensive.

A. W. Pride—Some companies are using current protected transformers without fuses, depending on a pole-top reclosing switch. If you do not have more than 10 lightning storms a year, you do not need deion protection. Losses are too low to warrant this.

Locating Faults in Underground Cables

By J. S. VOLPE
Portland General Electric Co.

THE subject of finding faults in underground cables has been well covered in trade literature, which is the reason I did not want to write a paper on the subject. It would be merely repetition. I will just touch on the principal uses of the three methods. These three methods are (1) electrostatic, (2) loop and (3) signal or inductive method.

Sometimes when we get an open circuit, it is one that has burned open and carbonized leaving a high resistance open or ground. On this kind of fault, the electro-static method is used. We compare the capacities of either end of the open cable against the capacity of a good wire at the same time, but we must know the capacity of the cable we are testing.

Sometimes when a fault develops, the dispatcher will try re-closing the circuit once or twice and may wreck the cable by this process. We can use the loop method in such cases when there are one or two good wires or an adjacent good wire. The difficulty here is to get a ground that is measurable. The ordinary Wheatstone bridge has a sensitivity of say 1 to 10 micro-amperes, which is not sufficient to measure a ground of more than 2,000 or 3,000 ohms resistance. Our company has a galvonometer, a laboratory instrument, with a sensitivity to measure .0002 micro-amperes, and using this with the regular Bridge we can measure a ground of 50,000 ohms.

The new Morse-Newhall Bridge is a wonderful instrument.

The signal method is used when all wires are open or grounded and there is no good wire available. In our company we use the Lundin fault finder.

One of the most complete articles on locating cable faults is the EEI Bulletin of July 1933, publication A-12.

Electrical World of Aug. 27, 1938, described the new Morse-Newhall bridge. The EEI Bulletin of March, 1939, also contained an article on cable fault finding. An English publication, the *Post Office Electrical Engineering Journal*, July 1937, described a new method of locating faults when no good wire is available.

Most trouble on cables come from a ground of one conductor. If you reclose the circuit, you may burn the other two conductors open and wreck the cable. It would be cheaper to find the original fault first and repair that.

* Abstract of extemporaneous remarks.

Estimating Loads From Customer Kwh.

By M. F. HATCH
Washington Water Power Co.

This paper will be published in the June 28 issue of *Electrical World*, because of the particular interest in that publication in the subject of programmed distribution.

Street Light Efficiency

Study brings savings through very close transformer adjustment

By J. F. EMERY
Idaho Power Co.

A NEVER-ENDING insistence by management for more efficient utility operation and reduced costs has necessitated dismissing many pre-fixed ideas, and reviewing with an open mind every operation that contributes to expense. So, in the fall of 1940, we began a critical analysis of the various components of expense in connection with our street-lighting service.

Lamps, of course, represent one of the larger expense items, and it is only natural that life, lumens and current characteristics should be examined to see what possibilities might exist for improvement or savings.

While data of this nature have been referred to many times in previous years, their full importance often has not been realized or utilized. For example, only ½% downward variation in current from the correct point will reduce lumens 2.8%; the same ½% variation upward will decrease lamp life 11%. One-half per cent of 6.6 amp., the correct current, is only 33 miliamps. Bearing in mind that ½% is the limit of accuracy for most instruments used in field work and that about the same limit applies to the adjustment of watt-hour meters, the following questions could hardly be left unanswered:

Are these transformers as sensitive as the watt-hour meter?

How well do they regulate?

What is the effect of changing primary voltage?

Our investigation was started to find an answer to these and many other questions. The problem can be appreciated by referring to the characteristic curves of Mazda C street lighting lamps.

These curves illustrate clearly how accurately current must be controlled if lamp life and lumen output are to approach design values.

To obtain preliminary information tests were made on some spare units in our transformer repair shop. These tests definitely proved one thing: that our street lighting transformers had been taken too much for granted. They were found to regulate poorly. The range of what could be called regulation was small, and changes in primary voltage definitely affected the secondary current at certain loads. It was quite evident that this particular piece of apparatus could stand a great deal of scrutiny to determine just how well it operated and what improvements in results might be possible. It was also found that the transformers tested could be made to perform satisfactorily if properly adjusted and their inherent limitations recognized.

While mechanical and electrical perfection in our equipment is desirable, we can proceed toward this goal only as long as it reflects a saving in over-all costs. The actual cash benefits that might result from such an investigation were difficult to forecast; however, it appeared reasonable that the increase in lamp life would more than justify the expense of carefully checking each transformer.

Proceeding on this assumption, a de-

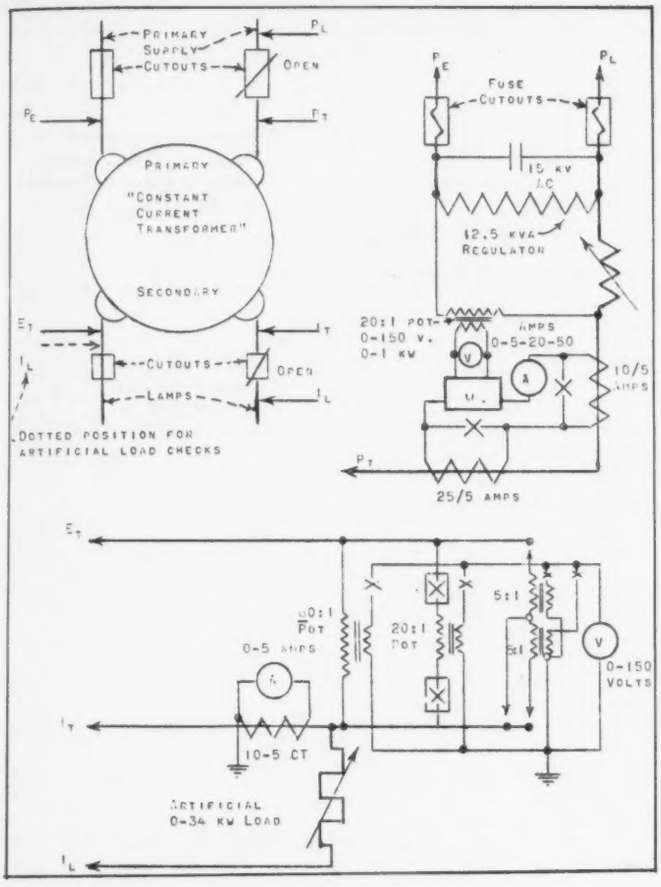


Fig. 1—Schematic diagram of street-light transformer testing equipment used by Idaho Power Co.

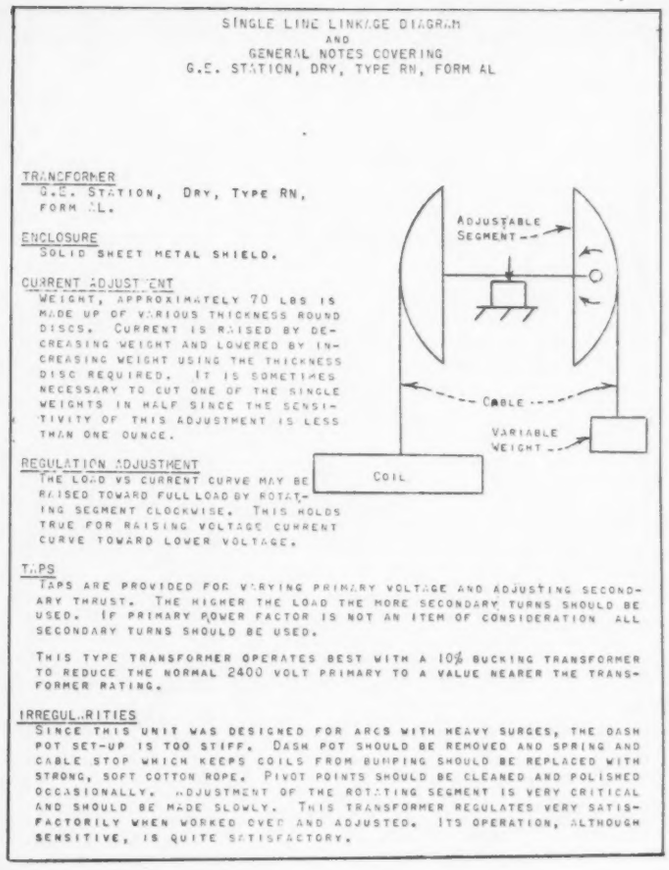

SINGLE LINE LINKAGE DIAGRAM AND GENERAL NOTES COVERING G.E. STATION, DRY, TYPE RN, FORM AL
TRANSFORMER
G.E. STATION, DRY, TYPE RN, FORM AL.
ENCLOSURE
SOLID SHEET METAL SHIELD.
CURRENT ADJUSTMENT
WEIGHT, APPROXIMATELY 70 LBS IS MADE UP OF VARIOUS THICKNESS ROUND DISCS. CURRENT IS RAISED BY DECREASING WEIGHT AND LOWERED BY INCREASING WEIGHT USING THE THICKNESS DISC REQUIRED. IT IS SOMETIMES NECESSARY TO CUT ONE OF THE SINGLE WEIGHTS IN HALF SINCE THE SENSITIVITY OF THIS ADJUSTMENT IS LESS THAN ONE OUNCE.
REGULATION ADJUSTMENT
THE LOAD VS CURRENT CURVE MAY BE RAISED TOWARD FULL LOAD BY ROTATING SEGMENT CLOCKWISE. THIS HOLDS TRUE FOR RAISING VOLTAGE CURRENT CURVE TOWARD LOWER VOLTAGE.
ADJUSTABLE SEGMENT
CABLE
VARIABLE WEIGHT
COIL
TAPS
TAPS ARE PROVIDED FOR VARYING PRIMARY VOLTAGE AND ADJUSTING SECONDARY THRUST. THE HIGHER THE LOAD THE MORE SECONDARY TURNS SHOULD BE USED. IF PRIMARY POWER FACTOR IS NOT AN ITEM OF CONSIDERATION ALL SECONDARY TURNS SHOULD BE USED.
THIS TYPE TRANSFORMER OPERATES BEST WITH A 10% BUCKING TRANSFORMER TO REDUCE THE NORMAL 2400 VOLT PRIMARY TO A VALUE NEARER THE TRANSFORMER RATING.
IRREGULARITIES
SINCE THIS UNIT WAS DESIGNED FOR ARCS WITH HEAVY SURGES, THE DASH POT SET-UP IS TOO STIFF. DASH POT SHOULD BE REMOVED AND SPRING AND CABLE STOP WHICH KEEPS COILS FROM BUMPING SHOULD BE REPLACED WITH STRONG, SOFT COTTON ROPE. PIVOT POINTS SHOULD BE CLEANED AND POLISHED OCCASIONALLY. ADJUSTMENT OF THE ROTATING SEGMENT IS VERY CRITICAL AND SHOULD BE MADE SLOWLY. THIS TRANSFORMER REGULATES VERY SATISFACTORILY WHEN WORKED OVER AND ADJUSTED. ITS OPERATION, ALTHOUGH SENSITIVE, IS QUITE SATISFACTORY.

Fig. 2—Linkage diagram and general data sheet for one of the eight types of transformers.

cision was made to test all units on the system.

To carry out the program, available equipment for test purposes was mounted on a 1-ton truck. This equipment includes a 12½-kva. induction regulator, artificial loading resistors, necessary switches, instruments, etc. The schematic diagram of the test unit is shown in Fig. 1.

Before discussing the tests it might be well to review briefly the operation of constant current street-lighting transformers. As previously mentioned, this transformer has a fixed primary coil and a movable secondary coil mounted on an iron core. The moving coil is counterbalanced by a weight through some form of linkage system. The induced emf in the secondary produces a magnetic flux which opposes the primary magnetic flux, causing the coil to be repelled. As the coils separate, magnetic leakage is increased and a lower voltage is induced in the moving secondary coil. Under a fixed load impedance, a change in voltage results in a proportional change in current; and conversely, for a given voltage, a change in load impedance will cause a corresponding change in current. Since a state of balance is attained when the weight of the moving coil assembly is equal to the repelling force, which force in turn is proportional to secondary current, the transformers will maintain the secondary current determined by the size of the counterbalanced weight. The linkage system which ties the weight and the moving coil together should be arranged so that the effect of the weight on the coil is the same for any position. If this linkage is not linear, the secondary current will not remain constant with changes in coil position.

Until recently only station-type units were equipped with a linear linkage system. Because of this, most of the pole-type transformers in service now are capable of regulating accurately over only a small range. The older transformers designed for 2,000/2,200 volts and now being operated at modern voltages of 2,300/2,400 volts will not regulate at light loads because of insufficient coil separation.

The tests made were to determine secondary current response from no load to full load under various conditions of primary voltage.

"As found" tests were made first. These determined what mechanical or other deficiencies might exist that were subject to improvement and also furnished a basis for evaluating the net effect of any corrections made.

Repairs and adjustments were then made and the test repeated to establish "as left" conditions.

Seventy-four transformers were tested on the Idaho Power Co. system, representing as far as we know about all the styles and types that have been produced during the last several years. These 74 different transformers can be reduced to eight basic types.

This is in no way to be construed as a discussion of the relative merits of different manufacturers' products. It is intended solely as a study of characteristics to the end that these transformers may be intelligently installed and operated.

Typical results are shown in Fig 3.

Results and Conclusions

The first question no doubt will relate to what, if any, savings resulted from this testing and correction work. This is answered in Table 1, showing savings in lamp replacements due to regulation correction on the transform-

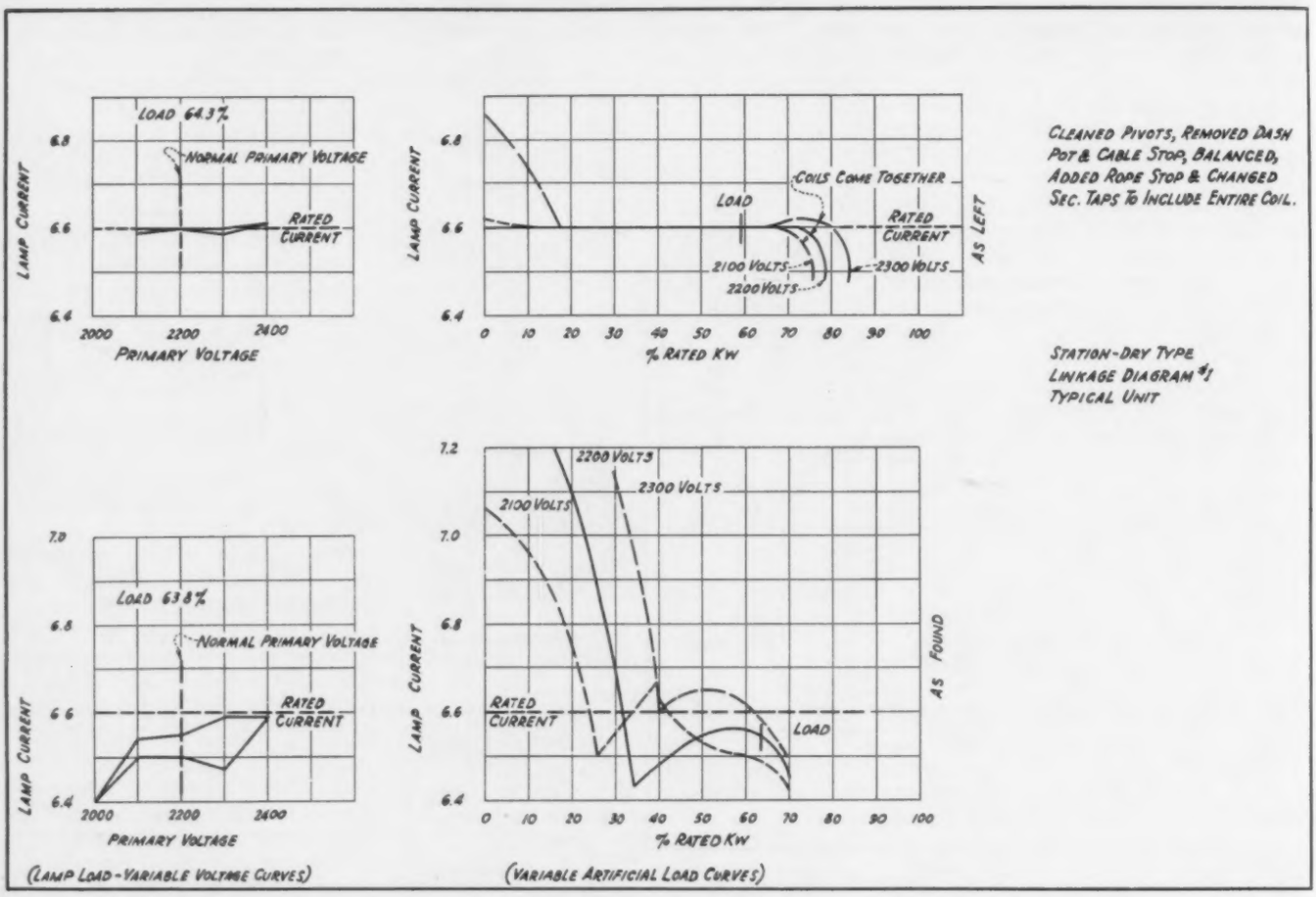


Fig. 3—Test and correction data for the transformer given in Fig. 2. Similar curves were prepared for the seven other types. These are: G-E dry, station type RB, Form L; G-E, Type RO, Form P; same, of second design; same, latest design; Westinghouse dry, station type; Westinghouse oil-filled, cast-iron tank; Westinghouse oil-filled steel tank

ers. In some instances the current of the lamp was slightly low, and, accordingly, adjustment had the effect of reducing lamp life. The tabulation includes all installations and represents a net figure. While the figure is an estimate subject to confirmation by 1941 results, the savings of $1,071 in lamps and $1,108 in replacement labor, or a total of $2,179 per year, should be a reasonably accurate forecast.

The curves demonstrate that the limits of the transformer with regard to loading, primary voltage, etc., must be recognized if proper regulation is anticipated. The units must be carefully installed and checked by a competent person. The final regulation must be made with accurate instruments. The responsibility for adjustments should rest with one person or in one department. Regular field operating forces should not be allowed to make or change adjustments. At least once a year a check should be made of the transformer to determine its mechanical condition, regulation and loading.

The basic reasons for the limits found in the various units are:

(1) Primary coils on the older units were wound for 2,000 or 2,200 volts. When operated at modern voltages of approximately 2,400 volts the coils cannot separate far enough to allow regulation at light loads.

(2) Many of the older-type transformers do not have a linear linkage system, limiting accurate regulation to small changes in load.

(3) Friction in any form in the linkage system or in the movable coil supports, guides or dash pot will result in erratic and improper regulation.

Table I — Savings in Lamps and Lamp Replacements Through Regulation Correction of Constant Transformers

	Lumens 1,000	2,500	4,000	6,000	TOTAL
No. of lamp locations	1,406	2,019	1,383	442	5,250
No. of lamp replacements, 1940	3,608	4,602	3,287	1,222	12,719
Percent replacement lamps, 1941*	11.5	23.1	17.4	13.7	17.7
Lamp replacement cost—1940	$865.92	$2,208.96	$1,873.59	$989.82	$5,938.29
Lamp replacement cost—1941*	$766.34	$1,698.69	$1,547.58	$854.21	$4,866.82
Savings—lamp cost only	$ 99.58	$ 510.27	$ 326.01	$135.61	$1,071.47
Replacement labor saving at 50c per lamp	$207.50	$ 531.50	$ 286.00	$ 83.50	$1,108.50
Total Saving, 1941/1940	$307.08	$1,041.77	$ 612.01	$219.11	$2,179.97

*Estimated.

Olympic Peninsula Submarine Cable

By D. F. MISZ
Puget Sound Power & Light Co.

ADDITIONAL power requirements on the Olympic Peninsula, due largely to the national defense program, made it necessary to install a third submarine cable between the mainland and the peninsula across Puget Sound. The new cable is a three-conductor, 250,000 c.m., non-leaded type, 29/64-in. Okolite rubber insulation and No. 4 steel wire armor, with saturated jute wrapping

over the armor. While the cable is being operated at 13 kv. delta at the present time, it is suitable for operation at 23 kv. star with grounded neutral. Fig. 1 shows a one-line diagram of the present power supply facilities to the Olympic Peninsula and location of the new cable.

The topography of the Puget Sound area is such that a large number of long, deep water submarine cable crossings are necessary for electric power

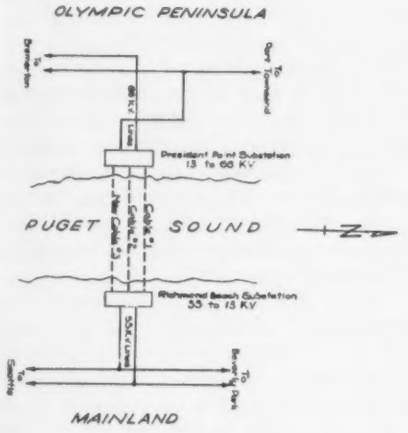


Fig. 1—Diagram of cable across Puget Sound

lines. Where length and water depth are too great for the ordinary method of allowing cable to roll over the edge of a scow, the continuous or transoceanic type of cableship and machinery are required. The cable for this installation was 4.38 in. in diameter and weighed 15.4 lb. per ft. With water depths in excess of 700 ft., many problems of tension and control were involved.

Previous installations of this kind were made from 2,700 ft. cable lengths spliced up to the required total length. Great care in vulcanizing and X-ray examination of each splice was necessary, which increased the cost of the job considerably. For this reason the new cable was purchased in one complete 22,000-ft. length and shipped in a string of four gondola cars, which were boarded up and chained together to prevent accidental separation, the cable being carried over from one car to the next.

Preliminary Plans and Preparations

In cable laying, as in any other job, success of failure is very much dependent upon the care with which preliminary plans and preparations are made. A federal permit is required before crossing any navigable waterway with electric conductors, and is, of course, the first preliminary job to be undertaken. Much of the data required for the permit application, such as water depths, distances, tide information and course to be followed, is also necessary in the actual cable laying operation. The course selected for this cable was parallel to and 500 ft. south of the previous last cable laid. This would permit raising the cables for repairs if necessary, without entanglement.

Two methods for keeping the ship on course were selected which could be used independently. Fig. 2, showing a portion of the East shore and course to be followed, illustrates both methods. Two large white targets were set up on each shore at locations visible from any point on the course and in line with the course to be followed. The ship, then, was known to be on course if it lined up with either set of targets. The second method was by the use of triangulation, with transits set up at points "A" and "B". Angles read between the base line and the ship, and plotted on a scale drawing, then gave the ship's actual location at any given time. Fig. 2 indicates the angles and line of sight taken to locate the ship at position No. 5.

Ship-to-shore communication is vital to successful cableship operation. Plans were made, therefore, to utilize the cable conductors by direct telephone communication between the ship and the eastern cable terminus, and also to use two-way short-wave radio between ship, tugs, Coast Guard cutter, and stations on shore. Two-way loud speaker units aboard ship then rounded out the communication system so that all observations and readings could be centrally received and coordinated, or instructions could be broadcast from a central location.

It was necessary to compile laying data (Fig. 3) from which speed of the ship, cable tension, and water depth could be determined. In case of failure of the dynamometer, correct cable tension could still be maintained by keeping the cable angle at the stern at the proper value.

The company's cableship "Wm. Nottingham," a former four-masted schooner of 1,380 net tons, 211 ft. in length, required considerable attention to provide adequately for handling such a heavy cable. An additional braking drum was installed and an emergency snubbing device was constructed of timbers. A steam cargo winch was installed to assist in lifting the cable from the hold, and the forward cable well in the ship's hold was enlarged to the maximum permitted by the width of the hull—about 35 ft. The fleeting knives on the laying side of the winding machine were equipped with rollers to reduce wear and friction.

The sequence of operations to be followed was thoroughly gone over at a meeting of the tugboat captains and supervisors of the installation crew. Instructions were issued covering the procedure to be followed during routine operations or in an emergency, so that each workman knew his particular job and knew how it fitted into the general scheme of things.

Weather forecasts, barometer readings, and reports from aircraft were studied before selecting the day for the cable laying. Storms can cause much delay and trouble because of blowing the ship off course or reducing visibility.

The four-car cable train was spotted on a spur track parallel to the cableship's berth and its 175-ton cargo of cable passed over sheaves suspended from cargo booms, thence through the steam-driven cable machine and down the hatch into the forward cable well. The entire 22,000-ft. length of cable was carefully coiled in the cable well, placing plank strips between the coiled layers. During this operation it was

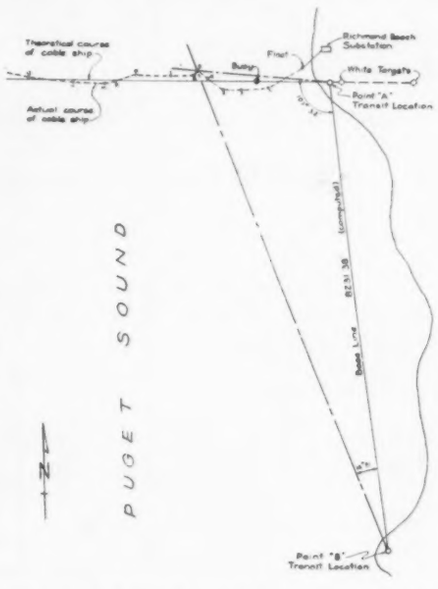


Fig. 2—Methods used in keeping cable ship on course

discovered that the jute wrapping prevented the necessary opening up of the steel armor during coiling and caused the armor to "bird cage," bursting the jute wrapping at intervals. To overcome this the wrapping was split lengthwise as the cable came on board, thereby allowing the armor to open up gradually along the entire length of the cable.

A 90-ft. scow was anchored off shore in water depths sufficient to accommodate the ship and tugs on each side of

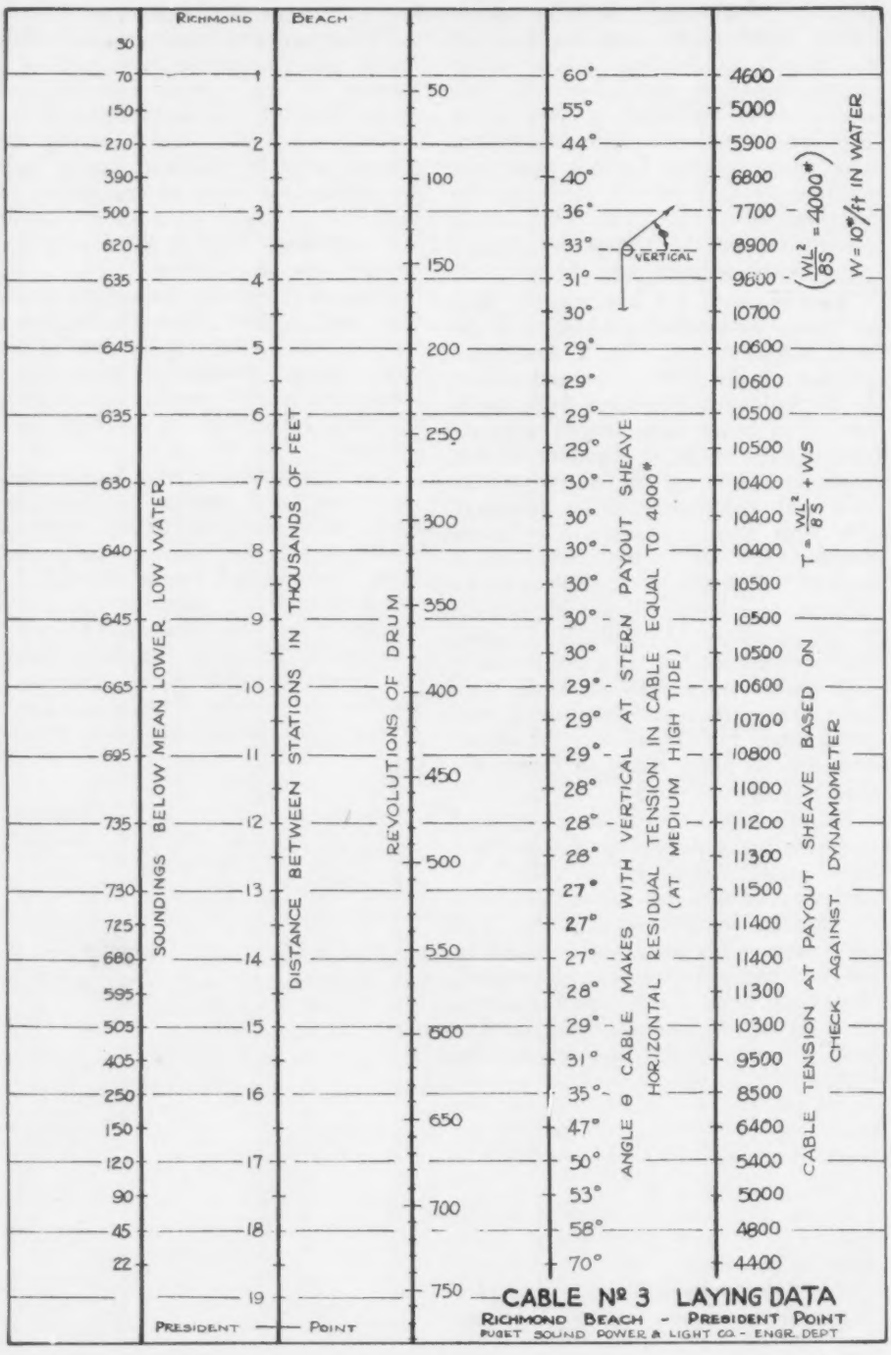

RICHMOND
BEACH
SOUNDINGS BELOW MEAN LOWER LOW WATER
DISTANCE BETWEEN STATIONS IN THOUSANDS OF FEET
REVOLUTIONS OF DRUM
ANGLE θ CABLE MAKES WITH VERTICAL AT STERN PAYOUT SHEAVE
HORIZONTAL RESIDUAL TENSION IN CABLE EQUAL TO 4000*
(AT MEDIUM HIGH TIDE)
CABLE TENSION AT PAYOUT SHEAVE BASED ON
CHECK AGAINST DYNAMOMETER
T = WL²/8S + WS
(WL²/8S = 4000*)
W = 10*/ft IN WATER
VERTICAL
CABLE Nº 3 LAYING DATA
RICHMOND BEACH - PRESIDENT POINT
PUGET SOUND POWER & LIGHT CO. - ENGR. DEPT
PRESIDENT
POINT

Fig. 3—Cable-laying data used in installing No. 3 cable across Puget Sound

the channel for handling the cable ends. Buoys were also located at the turning points near the barges where the cableship was to start on its true course across the Sound.

Cable Laying

The ship began her journey from the Shuffleton wharf at 3:40 a.m., on Dec. 12, passed through the Lake Washington Pontoon Bridge, Lake Union, and the U. S. Ship Canal Locks to Puget Sound. The ship was handled by a 750-hp. tugboat lashed alongside the stern on the starboard side, and a 500-hp. tug on a hawser line ahead. A 150-hp. tug stood by and assisted in the maneuvers necessary in getting off the cable ends. At 8:29 a.m., when anchor dropped off the eastern cable terminus, it was found that weather predictions had proved correct — a bright, sunny day was in prospect, with smooth water and very little wind.

The cable end, which had been previously brought up from the cable well, threaded through the winding machine, dynamometer, and stern fairway sheave, was fastened securely to the scow on the East shore. At 9:40 a.m., when all was in readiness and the tide was right, the actual cable laying was started, controlling the paying out of cable with the brakes on the winding machine.

The U. S. Coast Guard furnished a cutter and two patrol boats to detour ships and ferry boats in the busy channel, so that the cableship could hold her course and speed without deviation. The dispatch with which the cable was laid can be attributed considerably to this fine and courteous service.

The main winding drum, around which four turns of cable were wrapped for snubbing, is 92 in. in diameter with a 36-in. face. A 150-hp., two-cylinder steam-driven engine on one side and braking equipment on the other are connected to the main drum through gear reductions, and two additional brakes are direct-connected on each of the main drum shafts.

The cable wraps on the main drum were kept tight by the weight of about 25 ft. of cable coming up from the hold, and by the cable passing over two grooved tension sheaves with brakes mounted on a carriage back of the winder. A small steam winch with a grooved pulley is mounted on the upper deck to assist in lifting the cable out of the hold when necessary, such as in shallow water or when passing the cable from one well to another for inspection or repair. Roller bearing fleeting knives on each side of the main drum push the turns of the cable across the drum face as it winds over. This equipment has been used successfully for laying heavy submarine cables for many years, and will handle a cable of any length that can be coiled in the ship's hold.

Angle shots to the ship were taken with a transit from each end of an 8,231-ft. base line on shore (see Fig. 2) at intervals of two or three minutes, from which the ship's position was quickly determined on a scale map. Deviation from the course was immediately announced through the loud speakers for the attention of the tug captain. In spite of tide, wind, and the devious tendencies of a group of boats, the ship was held within a few hundred feet of its correct course at all times. It was found that points near the western cable terminus were difficult to obtain by the triangulation method because of the distance and visibility from triangulation points. This difficulty will be overcome in subsequent cable jobs by locating a base line on each shore and using four transits instead of two. In case of a communication failure, transit men were instructed to take readings at definite

time intervals so that the actual course of the ship would still be available.

Stop watch readings were taken at each tenth revolution of the main drum, representing approximately 250 ft. of cable paid out, and immediately converted into miles per hour (see Fig. 3). Any marked deviation from the desired speed was announced for the attention of the tug captain. An average speed of 2.8 miles per hour was maintained.

The cable tension was varied as nearly as possible in accordance with the schedule (see Fig. 3) by the brake operator, who was within sight of the dynamometer and was kept advised of the ship's position by the drum revolution count. Dynamometer indications are sometimes sluggish with such a heavy cable; consequently, as a check, the brake operator was also furnished tension data by the observer reading the angle of the cable leaving the stern.

Cable insulation resistance was measured in the cable well every few minutes during laying operations in order to detect immediately any injury to the cable. If such cable injury had been detected, all operations would have been reversed and the cable lifted back for examination and repairs.

At 11:15 a.m., 1 hr. and 35 min. after leaving the eastern terminus, the ship completed the actual cable laying and dropped anchor alongside the anchored scow off the west shore. Extra cable was coiled on the scow to be pulled off with a winch line into the shallow water off the western shore and spliced to shore-end cable on the beach.

To eliminate corona cutting and to utilize the full water-cooled capacity of the submarine cable, three single-conductor, 600,000 c.m., shielded, lead-covered, shore-end cables are spliced on each end of the main cable at a point below low tide. These shore-end cables are laid in a trench covered with split concrete tile, and brought up the beach to their termination in 35 kv., single-conductor potheads on the substation structure.

Some jobs in the past have made it necessary to work night and day because of stormy weather hampering work, or because of trouble developing in the laying operations. For this reason the ship is equipped with steam-heated sleeping quarters for the men, and electric floodlighting facilities for illuminating working areas. Meals are served on the tug boats.

Upon completion of the cable laying the ship sailed back to her berth at Shuffleton, arriving there at 8:00 p.m., just 16 hr. and 20 min. for the complete job. The organized efforts of experienced men, plus the careful advance planning and fine weather conditions, were instrumental in the smooth completion of the job.

Discussion

RAY RADER (in answer to questions)—This is a rubber compound cable. The limiting feature of its carrying capacity is heat in the conductor. There have been changes in rubber insulation in recent years, and in the newer cables the rubber will stand up to 70 deg. C. We made some measurements of the heating characteristics of the cable buried in sea water. We are loading it well within the manufacturers maximum allowable capacity based on heating, and this gives us 15,000 kva. per cable. At the shore end where the cable comes out of the water, we are using more copper since the cable heats more in air than in water.

Code Committee*

Code Committee Activities

By M. T. CRAWFORD
Puget Sound Power & Light Co.

THE ACTIVITIES of the Code Committee this year have consisted principally of following up and keeping in touch with applications and interpretations of the several codes under which member companies operate. No revisions have been made in the National Code since the 1940 edition was published, but there have been a number of situations where it has been necessary to interpret its provisions and apply them correctly, and the committee has handled such matters by correspondence.

The electrical inspection division of the Department of Labor and Industries of the state of Washington called a two day meeting of electrical inspectors in Olympia at which about 100 interpretations and enforcement rules were discussed, having to do principally with interior wiring installations as covered by the National Electrical Code. Your chairman attended these conferences at the invitation of A. J. Newton, chief electrical inspector for the state. The inspectors were most cooperative. A bulletin was issued by the department on Jan. 1, 1941, for the guidance of the inspectors and the public, putting these rules into effect, and copies of the rules have been sent to member companies operating in Washington.

The 1940 edition of the National Electrical Code makes it mandatory to use plug fuses of the so-called nontamperable type, known as type "S" fuses, on all installations on and after Nov. 1, 1941, in 15 and 30-amp. sizes. Those of us who form the light and power group on the Electrical Committee, N.F.P.A., made as good a fight on this as we could when the new code was being drawn up, as the necessity of carrying a stock of different types of plug fuses on service trucks will be very objectionable to light and power companies. The best we were able to do, however, was to obtain the appointment of a special committee, charged with responsibility for drawing up a standard for type "S" fuses, with the object of making the product of various manufacturers interchangeable with each other. This committee has made a report, which it is felt will accomplish the desired objective. Copies of this report and drawings of the standard fuse were sent to members of the Code Committee.

The electrical committee has scheduled a meeting for June 1941. There will not be another general revision of the code at this meeting, but a number of important matters will be followed through, interpretations made and procedures improved.

There are several inconsistencies in the wire tables of the code which will be taken up for clarification. Another matter which we plan to sponsor has to do with adequate over-current protection for 3-phase motors, to protect against burn-outs from single phasing of the service where supplied from wye-delta transformer banks.

The pending revision of the National Electrical Safety Code of the U. S. Bureau of Standards has been delayed considerably. A. B. Campbell, who has been very active on the sectional committee, states that the final revision is now out for letter ballot.

* M. T. Crawford, Puget Sound Power & Light Co., chairman. S. B. Clark, Northwestern Electric Co., vice-chairman. B. C. Electric Railway Co., W. G. Murrin; The California Oregon Power Co., S. M. Bullis; Eastern Oregon Light & Power Co., L. R. Grettum; General Electric Co., L. R. Elder; Idaho Power Co., H. M. Jones; The Montana Power Co., M. E. Buck; Mountain States Power Co., Geo. McClellan; Oregon Insurance Rating Bureau, F. D. Weber; Pacific Power & Light Co., J. E. Yates; Portland Chief Electrical Inspector, L. W. Going; Portland General Electric Co., F. H. Murphy; Preston Shaffer Milling Co., M. L. Watts; Soap Lake Utilities Co., Paul L. Fowler; Telluride Power Co., Paul P. Ashworth; Uintah Power & Light Co., V. A. Bair; Utah Power & Light Co., J. Hyde Stayner; The Washington Water Power Co., L. R. Gamble; West Coast Power Co., Henry Berk; Westinghouse Electric & Manufacturing Co., V. B. Wilfley.

Electrical Equipment Committee* — Systems Engineering†

The Northwest Interconnection

Interconnected system operation and automatic control

By R. E. PIERCE
Ebasco Services, Inc.

THERE are certain operating procedures and general principles of application of automatic-control equipment which, although already in extensive use in the Pacific Northwest, might well be unanimously adopted by all of the interconnected electric power systems in the Northwest as a means of better coordination and more efficient use of generating and transmission facilities.

Interconnected operation of systems and automatic control of system speed and tie-line loads are not new to the Northwest. Automatic frequency control at WWP's Long Lake hydro station, control of phase angle between Montana Power and WWP, and control of power interchange between Puget Sound P&L and WWP have been in service for several years. More recently, additional applications of automatic frequency and tie-line load-control equipment have been made at Bonneville and on the systems of Northwestern Electric and Portland General Electric. Also, automatic equipment is being installed in Utah for control of frequency and power interchange between Montana Power and the Utah-Idaho interconnected system.

It is not the purpose therefore in this paper to present any new theory of interconnected operation or automatic control. Rather, attention is directed to the need for unanimous agreement and general acceptance and use of specific principles of application of control schemes already developed.

The writer intends only to outline certain ideas and principles in this paper, but hopes it will serve as the basis of a comprehensive discussion and lead to the establishment of commonly accepted principles and practices.

Interconnected Operation

General principle No. 1 might well be stated: *Contractual relationships should be formed so as to permit and promote the greatest possible freedom in operating procedures and the greatest use and efficiency of physical facilities, rather than to place arbitrary limits against such operations and uses.*

It is perfectly feasible for all systems in the Northwest to operate as one interconnected network with any number of points of interconnection between any of the individual systems, and adequately to control the flow of power and equitably share the burden of speed control. It is both unnecessary and undesirable to sectionalize within or between systems of the group under normal conditions.

In order to realize the maximum possible utilization of all generating resources and transmission facilities, it should be taken for granted that all major electric systems in the Northwest will continue to be operated in the normal manner as one coordinated network without artificial barriers against the use of any existing interconnections or against the establishment of any additional interconnections that may be justified.

Frequency and Tie-Line Load Control

In the following discussion, the terms "major" and "minor electric systems" are used in the following sense:

A major electric system is any system or group, regardless of size, having both generating capacity and load, and operating at any time to supposedly generate its own load requirements plus or minus any scheduled interchanges with other major systems.

A minor electric system is any system or group, regardless of size, operating at any time to generate essentially a constant or base load, with variations in the load served from the system supplied over interconnections. Such a minor system might be considered part of the load of one of the major systems, or might be considered as part of the resources of one of the major systems, depending upon whether the minor system's generation was less than or exceeded its load.

General principle No. 2 is that: *Each major electric system should assume its equitable portion of the responsibility of frequency control for the entire group, as well as, and at the same time, automatically control the net interchange to or from its system to whatever extent or degree is appropriate.*

The earliest applications of automatic frequency and tie-line load control on groups of interconnected systems were based on the principle that one central system (and usually one generating station within that system) should control frequency for the entire group and all other systems should each control the load on the tie lines between its own system and the frequency controlling system. This was fairly satisfactory but was soon modified to the extent that the tie-line load controllers also took cognizance of frequency as well as tie-line load, and in effect, to a greater or lesser degree, assisted the central frequency controlling system in the burden of frequency control. This method of operation and control is now entirely feasible with presently available equipment and modifications which can be made, if necessary, to existing equipment.

General principle No. 3 is that: Each *major system should provide automatic control of the* net interchange *on all interconnections between itself and its neighbors.*

If each major system controls the *net interchange* between itself and all of its neighbors, then individual interconnections will be correctly loaded to the values that will result in the desired net interchange to or from each system. It would not be coordinated operation if any specific interconnection or number of interconnections demanded exact control, regardless of other conditions or consequences. For example, when generation is shifted from one part of the system to another to most efficiently meet changes in water supply conditions, the different phase-angle displacements within the system will cause a shift in the loading of individual lines and interconnections, even though the net transfers between systems of the group remain essentially the same. Equitable arrangements can and should be provided in contracts or by operating procedures for any extra losses or other burdens assumed by any of the systems, and, ordinarily, it should not be necessary to provide extra investment in phase-shifting transformers simply to permit any individual interconnection to operate at arbitrary scheduled values.

Thus, if a major system wishes to generate its own load requirements plus or minus any scheduled interchange values, it can and should have coordinated facilities for sharing in the automatic control of *frequency*, as well as control of the *net interchange*, over all

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† O. L. LeFever, Northwestern Electric Co., chairman, B. C. Electric Railway Co., A. Vilstrup; Idaho Power Co., H. R. Moore; The Montana Power Co., B. Hamilton; Pacific Power & Light Co., K. I. Davis; Portland General Electric Co., E. F. Anderson; Puget Sound Power & Light Co., Ray Rader; Utah Power & Light Co., D. L. Brundige; The Washington Water Power Co., G. L. Lane.

interconnections between its own system and all other systems.

If a minor system wishes to generate at any time, for example, only a portion of its load requirements, generating base load, and purchase the remainder of its requirements, not a scheduled value but whatever the load calls for, then this system should be considered, for control purposes, a part of the major system or systems supplying it with power, and it would not assume control responsibility.

Telemetering and Control Equipment

To accomplish principles (2) and (3), each system in the group that at any time will operate as a major system should provide telemetering, or equivalent facilities, to enable it in principle to continuously add up algebraically all of the tie-line loads between itself and all other major systems, and automatically control these to the algebraic summation of the several interchange schedules.

Actually, for control purposes, it is anticipated that there will be many instances where it will *not* be necessary to measure or telemeter *every* interconnection, but that it will usually be adequate to measure or telemeter only one of two or more similar interconnections, when it is known that under normal operating conditions, the total interchange over the several interconnections is proportional to that measured over the one interconnection selected.

In any case, the algebraic total of all of the interconnection loadings, or a suitable substitute therefor, for control purposes, should be made available to automatic-control equipment which will act on one or more "control" stations in each major system, in order to maintain desired or scheduled interchange values.

Such automatic-control equipment should have incorporated in it sufficient flexibility for either.

1. Frequency control (without respect to tie-line loads)
2. Tie-line load control (without respect to frequency)
3. Selective frequency control (assistance in straight frequency control but only when in so-doing tie-line loadings will not be caused to go outside of predetermined upper or lower limits)
4. Frequency—load-bias control (control of frequency *and* tie-line loadings in predetermined and adjustable relationships)

The foregoing list is considered to cover the minimum or essential functional requirements of automatic-control equipment. A considerable part of the equipment required is now installed or being installed on the several interconnected systems. Other functions might well be considered for specific applications, such as, for example, time-error bias or time control.

Coordination of Control

Of extreme importance is the necessity of having automatic-control equipments on the various systems not only capable of but adjusted for coordinated functioning. It would be in order, for this purpose, to develop more detailed specifications for telemetering and control equipment, covering such items as speed of response, and flexibility and range of adjustments; also to agree upon other more detailed bases of application and adjustment, as for example, the relationship of control response on each system to the normal rate of load change on that system.

The usual procedure for establishing such additional equipment and application principles is by group or committee action, comprised of experienced operating engineers from each of the major systems.

Discussion

M. T. Crawford (Presented in written form for the record)—One necessary provision to be included in contractual arrangements for interconnected operation of two utilities, has to do with the inadvertent flow of power in one direction or the other, which is to a certain extent unavoidable during such parallel operation. It is frequently desirable to operate the systems normally interconnected, even at such times as no power is being purchased or sold. During system trouble or at times of load changes, considerable blocks of power may flow in one direction or the other for short periods. It is customary to arrange for the return of such inadvertent energy transfers in the form of kilowatt-hours in like amount, and any operating balance at the end of one day is returned the following day. Such an arrangement simplifies the situation and avoids many complications.

J. W. Robinson (Presented in written form for the record)—Mr. Pierce has presented a number of interesting ideas in his paper among which the suggested approach by committee action on operating problems may well be productive of better regulation of the interconnection. The precedent for such committee action and the solution of these problems of regulation was set in this area several years ago during a prolonged dry season. Large blocks of power had to be transferred and the difficulties encountered led to joint study by operating engineers of the companies involved. The results are believed to have been quite satisfactory for larger amounts of power were transferred and interruptions of the interconnection were drastically reduced by certain steps recommended by this committee.

Each company forming a part of the present interconnection will benefit by better regulation and the latter is a mutual problem involving cooperation and coordination of a number of factors. For example, one of the most routine of all duties performed by an operator is the shifting of the load on his generators and the failure of any operator to do this properly on a large unit may produce results felt far beyond his own system.

Closer control of frequency will be beneficial since load distribution would be more easily maintained. Whether this be accomplished by using some other station for primary frequency control or by distributing the regulation through the use of automatic controls already installed, the benefits to the entire interconnection would be immediate. The location of the major steam capacity with its rapid response to speed change at the extremities of the interconnection has in the past resulted in undesirable load swings at times. Better frequency regulation would greatly minimize this condition.

In reply to Mr. LeFever's question, it can be stated that either manual or automatic regulation of all intercompany ties on the basis of load on these ties alone will not improve the frequency but will on the other hand nullify the efforts of the primary regulating station and tend to create instability in the entire interconnected system. The automatic tie-line control equipment now installed or shortly to go into operation provides various types of control action, some of which are arranged to vary generation on the basis of both the tie-line load and the frequency condition at any one time. In other words, the response is not alone to tie-line load.

O. L. LeFever—It is necessary for each company system to put its own house in order. I believe we will have to control the tie-line load and have automatic control of frequency at the same time.

A. W. Mathis—Improvements in the situation can be made not only by better adjustment of governors but better maintenance. If the governors at each of the companies' plants are so adjusted and maintained as to take care of the greater part of their own load and frequency, then the control will be more satisfactory. If we speed up the governors of all the interconnected plants and each watches his own situation, we won't have any trouble. We have not had trouble in coordinating

the governors of steam units with hydro units.

JOHN BANKUS—The problem also involves the control of reactive power as well as the control of real power. In some cases we receive reactive power when we don't need it.

GEORGE C. SEARS—There should be a committee from the interconnected companies to coordinate this control problem so that each company will do its proper share of regulation.

Electrical Equipment Committee—Meters, Service*

Demand Metering

By A. H. KREUL
Portland General Electric Co.

RAPIDLY increasing electrical power loads in the commercial and industrial areas of the Northwest stimulated by an active national defense program and by low electric rates have presented to metermen added problems of providing the most satisfactory equipment and adopting the best operating methods for properly metering the energy marketed to consumers.

The large amount of demand-metering equipment now made available by manufacturers and the numerous tariffs to which this equipment must be applied quite naturally suggest that an investigation of demand-meter practices would be desirable at this time.

Accordingly, a survey of such practices has been made by contacting eleven operating companies in the Northwest by means of a questionnaire to determine the kind of demand equipment in use, its application, performance, maintenance and special uses. Replies from all of the companies thus contacted make up the subject matter of this report.

Equipment

The total amount of demand measuring equipment reported is 9,856 devices, of which 8,736 devices, representing 87.6% are of the indicating types and 1,120 devices, or 12.4% are of the recording types.

The indicating types consist of 5,028 block-interval registers, 113 block-interval totalizers, 57 mechanical logarithmic registers, 2,038 thermal watt-demand meters and 1,500 thermal ampere-demand meters.

The recording and curve-drawing types consist of 831 block-interval-recording watt-demand meters, 6 block-interval graphic totalizers, 128 thermal recording wattmeters, 55 curve-drawing wattmeters and 100 curve-drawing kva. meters.

A survey as to the preference in the use of indicating equipment shows that four companies favor thermal watt-demand meters, five companies use demand registers exclusively and two companies indicate no preference though having a greater number of demand registers.

A similar survey of the use of recording and curve-drawing equipment shows that nine companies favor block-interval recording demand meters while two members prefer the thermal recording types. The round-chart block-interval type appears to be favored slightly over the strip-chart type. Curve-drawing wattmeters seem to be used largely on special installations for study and investigation.

Application of Demand Equipment

In general, the application of demand equipment by all companies is made to single and three-phase, commercial, non-residential light, heat and power services. A few companies provide direct-current service to which demand equipment may be applied.

The demand practice of one company bases the selection of the type of demand meter to be used on the ability of the meter to register accurately the maximum demand during the interval specified in the contract with proper consideration of the initial investment in the metering equipment and maintenance cost in relation to the revenue involved.

Indicating demand equipment generally is reported as being used on small loads and recording demand equipment as being applied to large loads.

The minimum load to which indicating equipment is applied varies considerably among operating companies, e.g., two report a load of 5 hp., two have a limit of 10 kw., two place the limit at 25 hp., and one reports a load of 50 hp. The larger companies seem to follow the practice of installing demand equipment on smaller loads.

The minimum loads to which recording demand equipment is applied range from 50 kw. to 500 kw., the average being about 200 kw. as reported by three members. One company installs recording equipment on lighting loads where the monthly consumption is over 1,500 kwh.

Curve-drawing graphic wattmeters may be used under one member's tariff if the load does not fluctuate too rapidly and the controlling demands are frequently of a duration equal to or less than 5 min., in which case the block-interval graphic may record less than the true demand.

Totalizers are used where it is desirable or necessary that simultaneous demands be determined on two or more power circuits or on one or more power circuits with one or more lighting circuits. The economy in the cost of equipment and wiring involved with totalizers as compared with recording equipment has been a large factor in their selection.

Most of the totalizing installations are of the indicating type, although several instances are reported where simultaneous demands are recorded on the round-chart block-interval type or on the strip and tape form. A few duplex block-interval-type installations are in operation. One company having a large number of totalizers in service reports the combinations of lighting, 220-volt and 440-volt, three-phase and 550-volt d.c. on a block-interval indicating-type totalizer with satisfactory results. Six companies do not use totalizers, and one company has discontinued future installations under a new tariff schedule.

Inquiry was made as to the practice of adding demands from separately metered services to obtain the total billing demand. Three companies follow this method to a limited degree, usually in instances when a small lighting demand is combined with a large power demand or vice versa and the cost of combining the services at one point of delivery is prohibitive. A recently filed tariff schedule by one member for commercial and power service provides that the service be furnished through one meter at one point of delivery and that any additional service for the same consumer at other points of delivery or at a different voltage or phase shall be separately metered and billed. This kind of tariff provision should be favorably received by metermen, who frequently have to deal with difficult situa-

* C. S. Alger, Puget Sound Power & Light Co., chairman. B. C. Electric Railway Co., P. C. Gill; The California Oregon Power Co., H. L. Scovell; Eastern Oregon Light & Power Co., L. E. Wiggans; Idaho Power Co., C. N. Teed; The Montana Power Co., E. W. Williams; Northwestern Electric Co., L. H. Kistler; Pacific Power & Light Co., Ellis Van Atta; Portland General Electric Co., A. H. Kreul; Utah Power & Light Co., J. Hyde Stayner; The Washington Water Power Co., K. C. Finley; Thos. S. Wood Co., T. S. Wood.

tions in obtaining the demand where a multiplicity of services are located at widely separated points.

Performance of Demand Equipment

The opinion is general that the performance of the present day demand equipment has been greatly improved over that of a few years ago and that comparatively little trouble develops after the initial installation has been once properly adjusted.

The contact devices for totalizers of the block-interval types are far superior to those of the earlier designs, so that a more complete registration of all impulses in the demand interval and, consequently a more accurate measurement of the demand, is obtained. The reduction of friction in the timing motors by means of better lubrication has produced a more accurate time interval. Considerable improvement has also been made in the adjustments for clutch and pointer friction as well as in reset devices.

Those companies using thermal demand equipment report good operating performance with relatively few troubles. One member finds that the permanent accuracy of this equipment is unimpaired if not subjected to much overloading. Knife-edge pointers on all demand-indicating devices materially assist in obtaining accurate readings.

Chart records are much improved with better inking mechanisms and by the use of a finer quality of ink. Wax charts are giving satisfactory results if used below the limit of recommended temperatures to prevent melting and blurring the record.

Strip charts occasionally run on top of the roller pins or jump the track and a suggestion is made than this condition can be corrected by reversing the direction of the rotation of the re-roll spool so that the chart is re-rolled in the same direction that it unrolls.

Maintenance of Demand Equipment

While much progress has been made in eliminating many of earlier troubles and defects in demand equipment, there are still some vulnerable points present which can only be remedied by a regular inspection and maintenance program. In this respect, reference is made to the two most important parts which produce an accurate demand during a specified interval, *viz.*, the contact device and the timing element. These will always require a certain amount of attention and merely illustrate the need of a well-defined program of maintenance, the frequency of which should be based on experience.

Nine companies indicate some such programs and provide for a complete overhauling of the equipment entirely separate from the periodical inspection usually made at the time the indicating devices are read and re-set or the tapes and charts are removed.

The maintenance periods vary with the kind of equipment to be overhauled and are grouped as to block-interval-indicating, thermal-indicating, block-interval-recording and graphic-curve-drawing types.

Block-interval-indicating-equipment periods range from one to three years, depending on the type and age of the equipment. The period for thermal indicating equipment is from three to five years, the majority favoring the longer time. One company, however, reports annual tests on this equipment at its installed location. Block-interval-recording periods vary from one to two years, the majority favoring the one-year period. One company makes quarterly tests on this type in the field. Graphic-curve equipment is usually reconditioned annually.

Regarding the cost of maintenance, several companies reported units costs, estimated and actual, and these figures were reduced as much as possible to a common basis of comparison because of the varying degree to which maintenance and overhauling is being done. The following unit costs represent a fair average of the various types of equipment.

Block-interval types range from $1.50 to $2.50 per unit for the older services and from $1.00 to $1.50 per unit for the more recent types. Thermal-indicating types vary from $1.00 to $1.50 per unit and block-interval-recording types are reported as costing from $2.00 to $6.00 per unit, the lower figure representing the majority report. Graphic-curve-drawing types average about $2.50 per unit.

Replying to a question about reading and inspecting equipment in the field, it seems to be the prevailing practice for meter readers to read and re-set indicating equipment in the course of their routine work, while experienced meter men read and maintain the recording and graphic equipment.

Special Equipment and Practices

Investigation as to the experience of companies with both logarithmic and block-interval equipment, with regard to the relative accuracy under various loads, resulted in a general opinion that over a long period of operation there is little difference in the demand registered. Loads having extreme, sudden swings would seemingly present a condition where inaccuracy might develop. An example of this kind of load is reported wherein a sand and gravel operation produces a variable demand of from 60 to 100 kw. at 3-min. intervals. A thermal indicating, a logarithmic register and block indicating device with a 30-min. interval installed simultaneously on this load show a variation of less than 3% in the demand over six months of operation.

Very few cumulative-demand registers are in use at present in this area. The advantages of having some means of checking previous demands do not seem to justify this additional cost. It seems logical to assume that no serious difficulty is experienced with the large number of standard indicating-demand registers now in service in obtaining accurate readings before the periodical re-setting is made.

Universal demand registers are proving satisfactory to those companies using them in sizable numbers on account of their flexibility. Other companies have considered the use of them from an operating and maintenance point of view, but have met with objections from billing and accounting departments on account of the multiplying constants involved. One large user of universal registers points out a distinct advantage in having a standard scale readily understood by meter readers. In this instance, a demand-meter reading slip is supplied to readers bearing a scale similar to that on the demand register on which the position of the sweep hand is marked at the time of reading. These marks are dated and remain on the slip for future reference. The objections from the billing department of this company about the introduction of additional constants has been overcome by a system of cross-checks.

The field of demand equipment is so well supplied by manufacturers at present that the meterman's problem is more a matter of selecting the proper equipment now available than of having to originate devices or methods to meet abnormal requirement.

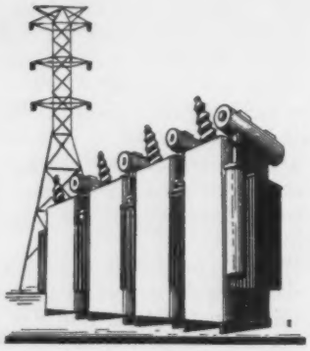
One instance is reported wherein thermal recording-demand meters are installed on substations with good results where there are reversed power readings. Another instance is reported wherein relays are installed on a three-phase power installation so that if a power failure occurs the timing clock is operated by single-phase service, thereby giving continuous timing and preventing erroneous chart readings.

An adapter has been developed by another member to permit the use of logarithmic demand registers on other makes of meters.

Radio interference from contacting devices in block interval recording equipment has been overcome by another company through either providing proper filters or correcting improper filters for these contacts and at the same time extending the life of the contacts by reducing the burning effect

caused by the make-and-break operation.

Another simple but effective device is reported for reading chart records more accurately. The device consists of a celluloid scale with two sliders which can be adjusted for any time interval desired. A horizontal and vertical mark on the scale aids in determining the demand more accurately when the scale is applied to any part of the load for the specified time interval set by the sliders.



Concluding Comments

In summarizing the information, a few observations may be made for consideration by metermen:

1. New tariffs are constantly requiring that smaller loads be equipped with demand devices, thereby resulting in the need of much added equipment.
2. The increase in demand equipment brings to metermen the problem of keeping installation costs to a minimum, particularly if the recording-type equipment is required. The present ratio of seven indicating for each recording type of demand device will not be apt to change unless a lower-priced recording instrument is available.
3. More attention should and will be focused on maintenance costs. More definite, economical programs of periodical maintenance will have to be established.

Low-Friction Bearings

By F. C. HOLTZ
Sangamo Electric Co.

(EDITOR'S NOTE: Holtz delivered a very interesting and informative lecture, touching on the history of jeweled bearings in watt-hour meters, the materials used, the development of the process for making synthetic jewels and studies of motion in the moving systems of watt-hour meters. The lecture was delivered extemporaneously with the aid of slides and black-board illustrations. Only a few of the high spots are abstracted for the record below.)

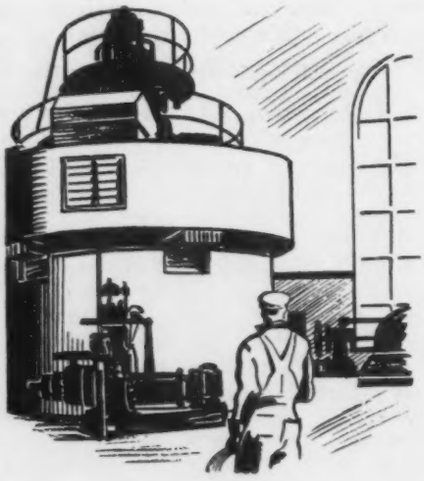
The development of the low-friction bearing dates back to the development of the time piece, which goes back to the 15th century. It was found that accurate time pieces were needed to determine the longitude at sea. An Italian developed the jewel bearing in the 16th century, and this brought about the type of bearings now found in meters.

The hardest materials known were rubies and diamonds. We now use a hard carbon steel pivot lubricated with fish oil. We haven't improved this system much. Fish oil disintegrates but there is no more satisfactory lubrication as yet discovered.

Most of our jewel bearings come from abroad. The position of the U. S. in the manufacture of jewel bearings is unfavorable because the labor cost of producing them here is higher than in Europe. In this national emergency we must depend almost wholly on Europe. The manufacture of jewel bearings requires a peculiar type of skill. The diameter of the jewel is only 0.010 in., and it has a hole in it 0.004 in. in diameter. This work can't be done automatically.

The Swiss are the best jewel makers, and much of the work is done by women. A woman jewel maker in a Swiss factory earns 15c per hour. Here, she would earn 75c. The war has created a problem for us since we can not rely on Europe much longer. The Germans refuse to permit the Swiss to send any more jewels to England. They are using glass there.

We have used a natural sapphire found in this country in the pebbles from placer mining in Wyoming, but we need a substitute.



We have tried making synthetic sapphires and we have done this successfully. It is made from aluminum oxide that is reduced by heat from aluminum sulphate and ammonium sulphate. This process is called calcining in a furnace, in which the sulphur and ammonia is driven off, leaving the aluminum oxide.

(Holtz showed slides illustrating the process of making synthetic sapphires).

We use an oxyacetylene torch and produce heat in the furnace up to 4,000 to 4,500 deg. F. We feed aluminum powder slowly down into the furnace, and this forms a boule of clear white sapphire which gradually grows to a suitable size for cutting, grinding and polishing. Color can be introduced into the sapphire if desired.

Holtz showed on the blackboard, the process of cutting, grinding and polishing these synthetic sapphire boules to make jewel bearings. The face of the bearing is polished with diamond powder which spreads a vitreous film on the uneven surface produced by the grinding. This vitreous surface sets like cement would set. These crystallized surfaces have different characteristics of wear in different directions.

Holtz explained the tests made to determine the best way of cutting the synthetic sapphire into jewels to obtain the best wearing qualities.

Holts then took up the question of rattling in watt-hour meters due to vibration, and illustrated by slides the tests made to determine the causes of this motion and the methods of minimizing it.

Modern Meter Testing Methods

By C. N. TEED
Idaho Power Co.

This paper was presented at the meeting of the meters and services sub-committee of the Electrical Equipment Committee and appeared in May ELECTRICAL WEST, p. 38.

Discussion

C. S. ALGER and J. H. STAYNER brought out the fact that stroboscopic testing equipment cost $750 and the photo-electric device, about $250. Mr. Alger stated that his company had not used the stroboscopic testing device on poly-phase meters. It can be used only if the disc is notched.

Electrical Equipment Committee Apparatus Design*

For location of one report of this committee, consult index on page 77.

* C. E. Cannon, The Washington Water Power Co., chairman. B. C. Electric Railway Co., A. Vilstrup; General Electric Co., J. F. Spease; Idaho Power Co., E. A. Woodhead; Northwestern Electric Co., O. W. Hurd; Pacific Power & Light Co., R. E. Forman; Portland General Electric Co., W. E. Enns; Puget Sound Power & Light Co., A. Shipek; Utah Power & Light Co., D. L. Brundige; West Coast Power Co., Henry Berk; Westinghouse Electric & Manufacturing Co., V. B. Wilfley.

Electrical Equipment Committee—Operation, Maintenance†

High Speed Condenser Timer

By E. T. VICKERMAN JR. and SAMUEL E. EDELSTEIN
Washington Water Power Co.

IT HAD become apparent, with the development of increasingly high-speed protective equipment for power systems, that there was need for a rugged, compact, portable instrument for high-speed testing. The original mechanical timer or cycle counter had not generally been considered accurate at speeds faster than one-half second, and many oil circuit breakers, relays, etc., have been developed which operate in much less time

Notwithstand the fact that various types of high-speed timers had been brought out from time to time, primarily for laboratory or shop testing, the relay, meter and testing department of Washington Water Power Co. undertook the development of such a timer. In construction of the instrument, attention was given to the special requirements of field and shop. Not only was this instrument designed for testing various circuit-interrupting devices, but also provisions were added for extremely low-burden testing, including, among other things, high-voltage, capacitor-type potential devices and continuity of any de-energized circuit.

With consideration given to portability, ruggedness, accuracy, and type of power available under any conditions of testing, a condenser-type timer such as was experimented with by Neher and Van Roberts of RCA, in 1933'* was chosen as the theoretical hub about which this multi-use timer was built.

The proposition was based on the fact that when a constant direct-current potential is impressed across the terminals of a fixed condenser and resistor in series a definite relationship exists between the charge absorbed by the condenser and the time of charge.

This is better expressed by the formula:

$v = E\ (1 - e^{-t/RC})$, or

$e^{-t/RC} = \text{antilog}_{10}(-0.4343 \times t/RC)$, where

v=charge in volts built up on condenser in time t.
E=constant direct-current charging potential in volts.
C=capacity of condenser in farads.
R=ohmic value of resistor.
t=time of charge in seconds.
e=base of natural logarithms.

The charge absorbed by the condenser under the above conditions can be easily measured by means of a vacuum-tube voltmeter.

A schematic wiring diagram of the circuit is shown in Fig. 1. It shows the operating circuit of the relay under test set up in the conventional manner, the testing circuit being closed by one side of a double-pole switch. The contacts of the relay under test are connected to a suitable direct-current source and in series with the coil of a "stopping relay." This stopping relay should be fast and consistent in performance as possible, since its time of operation must be subtracted from the total time of condenser charge to obtain the net operating time of the relay under test. A high-speed telephone type of relay having single-pole double-throw contacts is suitable for this purpose and may be conveniently calibrated in the actual set-up to find its time of operation by using the condenser timer itself.

For simplicity, plate and filament voltage supplies for the vacuum tube are shown derived from a single d.c. source. This is impossible in field practice for not all stations carry a d.c. supply and those that do usually have too low a voltage for satisfactory operation. The actual timer has two rectifier power packs: one in the timer unit to furnish a constant d.c. condenser-charging source and one in the vacuum-tube voltmeter unit to furnish not only a constant zero-bias plate voltage but also filament current for the number 45 triode tube.

Charging voltage is shown (Fig. 1) applied to the condenser C through the second pole of the switch and the resistance R. The circuit is completed through the back contacts of the "stopping relay." When this relay operates, it breaks this connection and connects the resistance side of the condenser to the cathode of the 45 tube. This stops the charging of the condenser, but since the other side of the condenser is connected to the grid of the 45 tube, the voltage to which the condenser has been charged now appears between the grid and the cathode of the tube. When the stopping relay is reset, the condenser discharges through the resistance R in series with the 1-megohm resistor shown. The condenser will be substantially discharged in a period of time equal to ten times the "time constant" of the circuit [in this case, it equals $C\ (R+1)$].

The multi-use timer was modified and constructed for varying field and shop use. It might be added at this point that many modifications were made and when the final wiring diagrams were completed it was almost a problem in itself to locate the original basic Neher and Van Roberts plan.

It was decided to build the instrument in two units—that is, a timer unit and a vacuum-tube-voltmeter unit. By so doing, the vacuum-tube voltmeter could be used as a separate instrument for other purposes.

The vacuum-tube voltmeter unit was provided with a 40-microamp. movement, 7-in. scale Triplett foundation instrument. With an instrument of this type it was possible to include provisions for making a variety of low-burden tests in the field without additional meters or equipment. Low-burden tests had been found very necessary in cases where, if a higher-burden instrument were used, the accuracy of the test would be too badly impaired to be of any value. Among the possible readings that could be obtained from the Triplett meter were a.c. volts, d.c. volts, d.c. milliamperes, d.c. micro-amperes, and ohms. A time scale was calibrated

† Carl D. Raney, The Washington Water Power Co., chairman. B. C. Electric Railway Co., B. deM. Mertens; The California Oregon Power Co., V. W. Hammond; Eastern Oregon Light & Power Co., O. D. Lanning; Idaho Power Co., R. D. Jefferson; The Montana Power Co., J. P. Medlin; Mountain States Power Co., George McClellan; Northwestern Electric Co., Tom Perry; Pacific Power & Light Co., A. E. Frey; Portland General Electric Co., J. C. Henkle; Puget Sound Power & Light Co., R. H. Johnson; Utah Power & Light Co., H. H. Kreuger; West Coast Power Co., Henry Berk.

* "Timing High-Speed Relays," by J. H. Neher, ELECTRICAL WORLD, Dec. 2, 1933, p. 734.

Fig. 1—Simplified wiring diagram of a portable, high-speed condenser timer as given by Neher and Van Roberts (below)

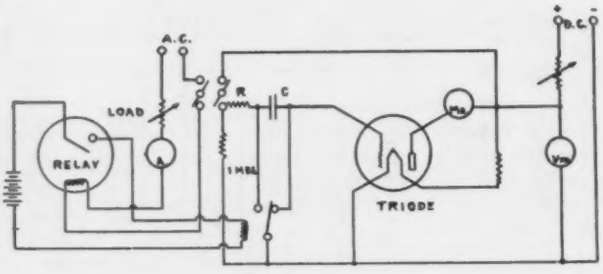
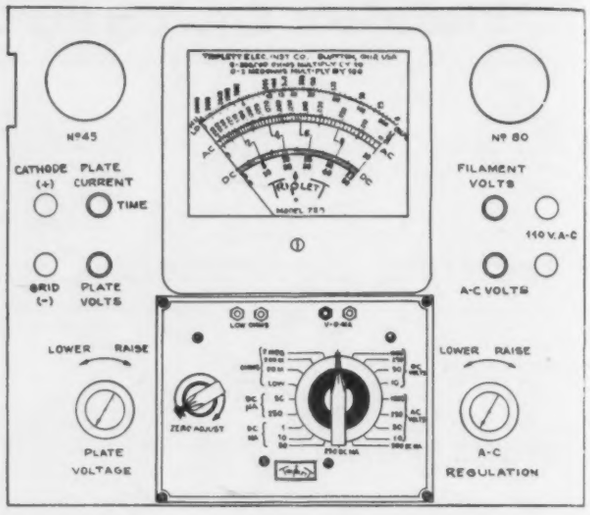


Fig. 2—Panel detail of the unit developed by engineers of Washington Water Power (right)



and superimposed on the d.c. 50-milliampere scale, so that, when used in connection with the timer unit, quantities of time could be read directly from the meter without reference to curves or data. Time readings of high accuracy were obtainable on an instrument of this type having a wide, easily-read scale.

Fig. 2 shows the operating panel of this voltmeter unit.

Fig. 3 shows the phantom wiring diagram of the same unit.

In the simplified wiring diagram of Fig. 1, if the circuit were bisected vertically just to the left of the number 45 tube, the right half of the drawing would represent the vacuum-tube voltmeter unit.

The modified vacuum tube meter, as shown in Fig. 3, consists of a No. 45 triode tube, a power pack to supply plate voltage and power with suitable inputs, the combination foundation instrument to read plate current and voltage as well as transformer primary volts and filament volts, suitable controls to regulate these values, and binding posts with which to connect a potential between the cathode and the grid of the 45 tube.

When this box is used alone as a vacuum-tube voltmeter, 110 to 120 volts a.c. is connected to the two binding posts on the right-hand side of the box. If it is used in conjunction with the timer unit, this is unnecessary, because the voltmeter unit then receives its supply from the timer unit through a 4-wire interconnecting cord. If, in this case, alternating current is applied at both places there is a possibility of crossed connections and a short circuit. Therefore, fuses are provided in the circuit from the binding posts.

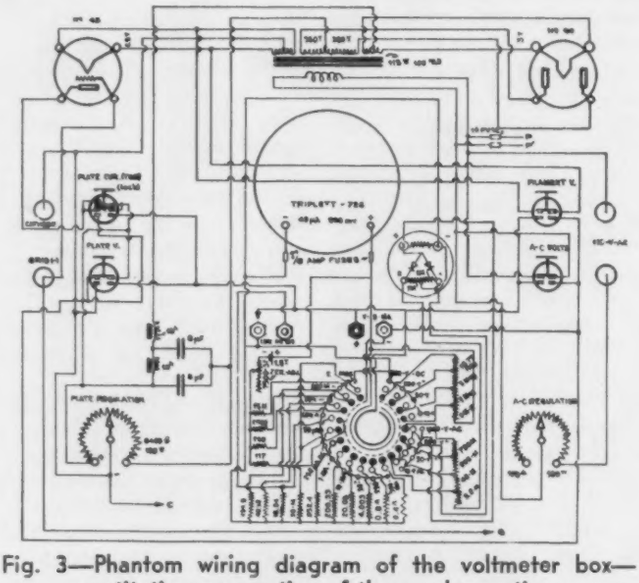


Fig. 3—Phantom wiring diagram of the voltmeter box—constituting one section of the condenser timer

The control in the lower right-hand corner of the diagram is the alternating current supply control (not used when supply is obtained through 4-wire cord from timer unit).

The control in the lower left-hand corner is the plate voltage control for the 45 tube. This plate voltage should be set to allow 50 milliamperes of plate current to flow with the grid shorted directly to the cathode through the binding posts on the panel (shorted through telephone toggle switch when used with timer unit).

For measuring direct current potentials of less than 70 volts by means of the vacuum-tube meter, the negative side of the potential to be measured is connected to the lower stud on the left side of the panel, titled "Grid," and the positive side of the potential is connected to the binding post directly above, labeled "Cathode".

To measure direct current voltages in excess of 70 volts it is necessary to insert a radio B battery in series buck with the potential to be measured. Then the voltage read on the vacuum tube meter plus the voltage of the B battery is equal to the unknown potential. This procedure is necessary, because, under the operating conditions of the unit the cut-off point of the 45 tube is approximately 70 volts.

Example:

A potential suspected of being approximately 200 volts is across a 5-megohm resistor. The use of an ordinary relatively low-resistance voltmeter collapses the resistance of the circuit, but the meter registers 186 volts. Polarities are determined and identified. Four 45-volt B batteries are placed in series and measure 180 volts with the low-resistance voltmeter. The negative terminal of this battery pile is connected to the "Cathode" binding post of the voltmeter box, and the negative terminal of the resistor is connected to the

"Grid" stud. The two positive points of the above are connected. The Triplett meter on the unit reads 15.3 milliamperes and this is found to be equivalent to 32.6 volts grid bias on the 45 tube. Thus the unknown potential across the resistor is equal to 180 plus 32.6=212.6 volts.

For measuring time in seconds, when the unit is operated with the timer, read the time scale (0—0.2 sec.) and multiply values read by the multiplier as indicated on "Time Range" selector on the timer unit (Fig. 4).

The Triplett foundation instrument, as mentioned before, is a multiple-scale radio-type meter having a full scale sensitivity of 40 micro-amperes (200 millivolts). By means of a small copper-oxide rectifier and shunts and resistors, a selector switch allows the meter to read a large variety of a.c. and d.c. ranges. If the "Plate Current," "Plate Voltage," "Filament Volts," and "A.C. Supply" pushbuttons are "up," this meter is isolated from any circuits within the voltmeter box and can be used for any external readings by inserting test leads into the jacks provided.

The second unit of this multi-use timer combination, known as the "condenser-timer unit," (Figs. 4 and 5), required that many obstacles be overcome in its construction. There was the desire that no other equipment be needed with the timer in ordinary relay and switch testing, except the vacuum-tube voltmeter unit, an ammeter for reading current passing through the device under test, and a load box. In addition, since practically every station where any testing was at all possible was usually provided with a supply of 110 volts a.c. only, there was no question but that the instrument should be built to operate on that supply. Three types of power are required for operation of the unit: first, a low-voltage d.c. supply to operate the high-speed telephone-stopping relay; second, a.c. for passing current through the current coils of the protector being tested; and third, a constant d.c. potential for charging the condenser.

To meet the first requirement, a small-size portable 6-volt battery was used. Also terminals were provided for use of station battery where necessary and available.

To complete the second requirement, a.c. was taken directly from the supply.

For the third requirement, it was necessary to construct a suitable a.c.-d.c. power deck to operate from the a.c. supply.

Binding posts were provided for the operating panel of the instrument so that all testing connections could be made directly from, as well as controlled through, the timer unit. That is, these posts were installed for connecting the a.c. supply, load box, ammeter, relay-current studs, trip studs, and external battery when used. Built into the panel were also a three-pole and a single-pole knife switch. When closed, the three-pole switch energizes the current circuit to the relay and the charging circuit to the condenser. The single-pole knife switch opens or closes one side of the battery circuit to the stopping relay, while the contacts of the relay or breaker under test open or close the other side of the circuit.

Pushbuttons were used to be able to make a stopping relay calibration, to discharge the condenser, and to provide for the external battery. The circuit to the d.c. voltmeter was also provided with a pushbutton for reading the charging potential.

An a.c. resistance regulation controls the primary voltage of the power pack, and when used in conjunction with the vacuum tube voltmeter, controls the a.c. supply to the vacuum-tube voltmeter, which is fed from one unit to the other through a special connecting cord. This 4-wire cable also includes leads from the condenser in the timer unit to the grid and cathode of the triode in the voltmeter unit. In addition, a voltage-divider circuit serves as a means of regulating the d.c. charging voltage.

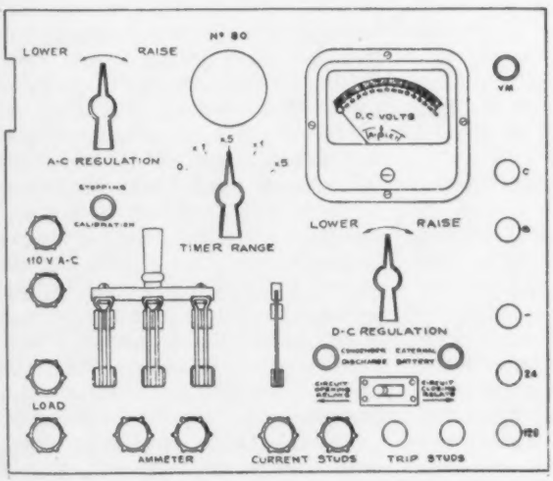
For use in either circuit-closing or circuit-opening tests, a telephone-type toggle switch was employed to transfer internal connections so the unit would be flexible enough for most conditions of field timing.

Several time ranges were naturally desirable; hence, a selector switch was installed on the panel to change values of resistances used in series with the condenser. Since the time registered on the vacuum-tube voltmeter is directly proportional to the series resistance, multipliers on each tap of the selector switch eliminated the necessity for more than one time scale on the vacuum-tube-voltmeter unit.

If the simplified wiring diagram (Fig. 1) were bisected vertically just left of the 45 tube, the left half of the drawing would represent the condenser timer unit.

The "main switch," or the large three-pole single-throw switch mounted in the lower left-hand corner of the panel (Fig. 4), initiates the timer by simultaneously closing the testing circuit and charging the condenser through a resistor. It is a 30-amp. switch, and can take 75 to 100 amp. momentarily. Two poles of the switch carry the testing circuit—ordinarily either the a.c.

Fig. 4—Panel detail of the relay test box—another section of the portable timer



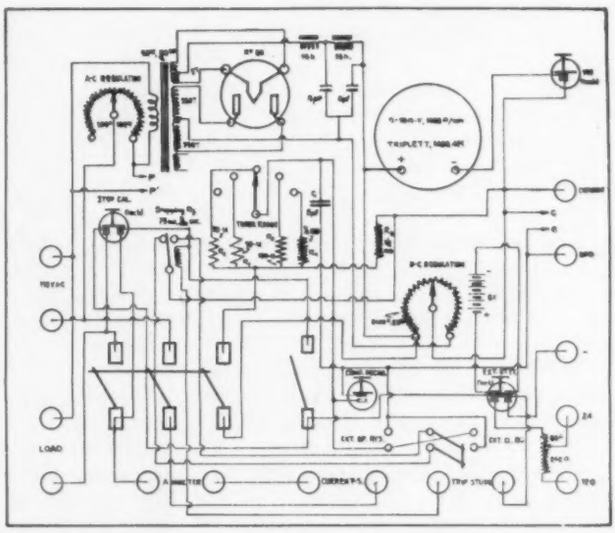


Fig. 5—Phantom wiring diagram for the relay test box —see panel detail in Fig. 4

used to operate the current coils of circuit-closing relays; or d.c. or a.c. to operate the tripping coils of circuit breakers or switches. The third pole connects the condenser to the charging source and proper resistor—much as the right hand blade of the operating switch in the simplified diagram (Fig. 1).

The "110 Volts A.C." binding posts furnish the power for both the timer unit and the vacuum-tube-voltmeter unit when both are used in conjunction as the "Complete Condenser Timer." Since the heavy testing current passes through the main switch of the timer, and since it is desirable to have but one place to tie in the station service for simplicity and safety, it is natural that they should be on the timer unit (sometimes referred to as the "relay test box"). The lower stud goes to the main three-pole switch, while the other goes to the load box binding posts. For safety, then it is recommended that the grounded leg of the station service be connected to the lower stud. In that case, if there is a ground in the relay or station wiring, the short-circuit will be limited by the resistance set on the load box, and thus there is better protection against blowing out the station-service fuses.

The "Load" binding posts are connected to the terminals of the load box. They also serve to isolate the left pole of the main switch when a stopping relay calibration is desired.

The "Ammeter" binding posts are connected to the ammeter to read the current being passed through the device under test. They, like the "Load" binding posts, complete the isolation of the left pole of the main switch during stopping relay calibration.

The "Current" binding posts are connected to the actuating element of the apparatus to be tested. For most occasions, this would be the current coil of a relay, or the tripping coil of a circuit-breaker.

These large size binding posts and main switch allow a simple, safe, and quick means of placing the relay in series with the load box and ammeter across the station service. They also allow one pole of the "main switch" to become completely isolated from any a.c. source during stopping relay calibration by taking off the ammeter and load box, leaving these four studs open-circuited.

The "Trip Studs" are to be connected to the actuated element of the apparatus to be tested. For most occasions, this would be the contacts of a relay or the blades of a circuit-breaker.

The high-speed stopping relay, as previously explained, stops the charging of the condenser, and connects the resistance side of the condenser to the cathode of the 45 tube in the voltmeter unit. The energizing coil of this relay is connected in series with the single-blade knife switch and the external relay's trip studs across a source of low-potential direct current, normally being an internal battery in the relay test box, or any special tripping bus arrangement in the station by means of special studs.

The telephone toggle switch is a reversing double-pole double-throw switch used to accommodate the simplified wiring diagram to both circuit-opening and circuit-closing devices. When this switch is in the "circuit-closing" position, the timer will test relays by energizing the high-speed relay at the instant the tripping contacts "make" thus stopping the charging of the condenser. When it is in the "Circuit-opening" position with the single-blade knife switch closed, and with the breaker to be tested closed, the stopping relay will become energized when the "Trip Studs" are connected across the terminals of the oil circuit breaker. However, due to the reversing action of the toggle switch, the two stationary contacts of the high-speed relay (Fig. 5) have been interchanged, and thus when the three-pole main switch is thrown for a test, the condenser becomes charged in the normal manner. At the instant the circuit-opening device's switch-blades open, the high-speed relay is de-energized, and the condenser ceases being charged, etc., as before.

The "Condenser Discharge" pushbutton—According to the theory presented in the fourth paragraph, the relationship between the charge built up across a condenser and the time of charging can be expressed in an exponential. Conversely, the same is true for discharging the same condenser, namely,

$$v = E \times e^{\frac{-t}{RC}}.$$

It is evident that if, under testing conditions, the operator does not fully discharge his condenser, that condenser will have a residual charge. In his next test, any additional charge on the condenser will create an error, since the whole scheme is based upon the condenser having zero charge at the instant of initiating the test.

Normally, as soon as the knife switch is opened for testing relays after the tripping has occurred and a reading taken; or as soon as a switch has been reclosed after circuit-opening has occurred and a reading taken, the condenser discharges itself across two resistances—the 1⅛-megohm resistor and the resistor associated with the time scale selected. Substituting these values in the above equation for maximum conditions, it is found that for practically full discharge, about 15-20 sec. are needed between tests. Therefore, a pushbutton is provided to discharge the condenser directly so no pause is required between tests.

The "External Battery" pushbutton connects the stopping relay coil and the trip studs of a relay or switch to an external source of d.c. potential. This pushbutton, of the locking type, when up, connects a small six volt battery within the relay test box to the stopping relay, and when tested relay or switch operates, the battery energizes the stopping relay. When the pushbutton is locked down, the internal battery is isolated from the unit, and the source of d.c. potential may be drawn from the station d.c. bus through the three small studs marked "—", "24," and "120" volts. This external tripping bus arrangement is made for special cases. Internal resistors cut down the current to eliminate the possibility of damage to the stopping relay coil, which operates at a minimum d.c. current of 70 milliamp., and can stand a temporary current of as high as 3 amp. It is not recommended that the stopping relay be energized for abnormal lengths of time, as either the relay may become overheated or the internal battery will be drained needlessly.

The external battery binding posts are the three small binding posts on the lower right side of the relay test box. They are cut into the stopping relay circuit by means of the pushbutton described above.

The single-blade knife switch is a necessary item for testing relays having holding coils as well as for all switches. When using a heavy a.c. testing current, it is desirable to open that circuit immediately after the operation occurs, to prevent excessive overloads on the station service, and the relay current coils, as well as to allow the adjusted a.c. inputs to the whole timer to return to normal before taking the time reading. At the same time it is necessary that the trip contacts on the relay be sealed together long enough by the holding coil so that a good reading may be taken on the timer scale, for if the contacts of the relay be separated, the stopping relay coil is de-energized and the condenser is quickly discharged. The knife switch allows an independent control over the high-speed stopping relay and the holding coil of a tested relay without interference from the three-pole main switch in order to remove the difficulties described above.

The "Stopping Calibration" pushbutton allows the time of operation of the high-speed stopping relay to be measured by the timer itself in a simple manner. The time of the stopping relay's operation, which is normally from 0.0045 to 0.0055 sec., should be

subtracted from the total time indicated on the Triplett meter time scale. Before making a stopping calibration it is necessary to remove the load box, ammeter, and relay from their respective binding posts. This is to isolate the a.c. station service from the internal d.c. circuit when making such a calibration. Locking the pushbutton merely places the d.c. source (either internal or external battery) and the energizing coil of the stopping relay across the left blade of the three-pole switch, and it is vital that this blade not be connected to any a.c. source.

To calibrate the stopping relay, the following procedure is followed after the usual adjustments of supply voltage, plate current, and charging voltage have been made with their respective controls (the supply voltage should be set at 110 volts, the plate current at full-scale deflection of the meter on the 50-milliamp. setting or "0" on the time scale, and the charging voltage at 100 volts during the actual operation):

1. Remove all leads from the load, ammeter, and relay current studs and trip studs binding posts. Open the main three-pole switch.
2. Short the trip studs binding posts.
3. Open the single blade knife switch.
4. Throw the telephone toggle switch to circuit-closing position.
5. Push and lock the stopping calibration pushbutton.
6. Turn the "time range" selector switch to the x 0.1 position.
7. Close the "main switch" and readjust charging potential to 100 volts.
8. Then open the "main switch," depress "discharge pushbutton," and re-close main switch. Read time on time scale of vacuum tube voltmeter unit and multiply by 0.1 for time of operation. (Variations in speed, gripping, side-thrust, etc., cause small discrepancies from 0.0005 to 0.00015 second, but very noticeable on the highest speed scale. Usually the error is negligible, and an average to the nearest 1/1000 second is ample). The time of stopping relay operation together with any error in the three-pole switch blades that will register on the time scale of the voltmeter box.

The power pack, consisting of a full-wave rectifier tube, power transformer, and double-pi section filter, supplies a smooth charging source for the condenser. The charging potential, maintained at 100 volts when the main three-pole switch is closed, is regulated by two controls: the so-called "A.C. Regulation," consisting merely of a 100-ohm, 100-watt series resistor, and a wider range "D.C. Regulation," which is a medium-resistance bleeder across approximately 250-volts output from the power pack, drawing approximately 40 milliamp.

The "A.C. Regulation" control adjusts the primary voltage on the transformers of both relay test box and vacuum-tube-voltmeter box when the two are used in conjunction with the connecting cord as the timer. The a.c. volts, read on the voltmeter box, should be maintained at approximately 110 volts, with a swing of not more than 5 volts in either direction. The only really critical parts of the circuit are the a.c. testing current (adjustable by the load box); the charging potential (adjustable by either of the two methods explained above); the plate voltage on the 45 tube in the voltmeter box (adjustable by its rheostat control), and the filament emission of the 45 tube (adjustable only by varying the filament volts in the secondary of the voltmeter box transformer). The only item depending upon the a.c. regulation alone is the last item, or the filament emission of the 45 tube in the voltmeter box. Fortunately, this tube's emission is practically constant at over 100 volts a.c. on the transformer primary (the plate voltage remaining constant), because of strong space-charge effects of this type of triode. Hence accuracy is not impaired if the filament temperature is varied over a 10% band in its normal operating range. This is accomplished by taking the primary normal operating potential at 110 volts.

The "D.C. Regulation" control is a 6,400-ohm, 25-watt bleeder resistor inserted across the filtered power-pack supply of approximately 250 volts, and the output voltage is measured by the voltmeter on the relay test box. This charging potential, placed eventually across the condenser, is maintained at exactly 100 volts during test by adjusting the control while the three-pole main switch is closed with the rated alternating current passing through the relay or switch current coils. This is necessary since most service transformers have poor voltage regulation when heavy currents are drawn from them.

The timer-range selector switch allows a selection of one of four accurately-calibrated non-inductive resistors. The timer range varies directly as the value of resistance put in series with the condenser. The ranges of the resistors with their multipliers for the time scale on the voltmeter box are as follows (positions indicated from left to right, Fig. 4):

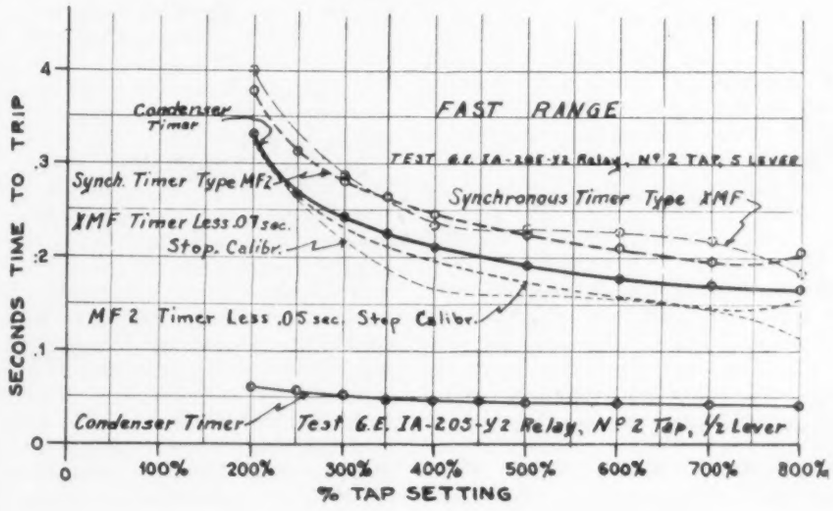
First position—(Off)
Second position—10,000 ohm) Multiply by 0.1, giving 0 to .02 sec.
Third position—(50,000 ohm) Multiply by 0.5, giving 0 to .10 sec.
Fourth position—(100,000 ohm) Direct, giving 0 to .20 sec.
Fifth position—(500,000 ohm) Multiply by 5.0, giving 0 to 1.0 sec.

These ranges according to the position selected are the slowest times that can be read with any degree of ease and accuracy on the time scale.

The D.C. voltmeter, through its pushbutton, shows the charging voltage available for the condenser. It may also be used during tube calibration of the 45 tube in the voltmeter box to provide a means of measuring grid bias as supplied by the power pack and control in the timer box.

The "Cathode" and "Grid" binding posts, when this unit is operated in conjunction with the voltmeter box as the timer, are not used, since the 4-wire connecting cord carries the cathode and grid leads to the voltmeter box along with the regulated a.c. power leads. In case, however, of the voltmeter box being damaged, or out of service, these

Fig. 6—Curves obtained on a relay by conventional cycle counter and by condenser timer



studs afford a means of connecting on to another vacuum-tube voltmeter.

Because the fundamental accuracy of the instrument depends upon the quality of condenser and resistors used in the "RC" circuit, as well as the consistent operation of the high-speed stopping relay, these parts were all very carefully selected and none of questionable quality was purchased. The condenser was a high-grade, Cornell-Dublier Dykanol, dry electrolytic type. The I R C Co. furnished non-inductive precision wire wound resistors guaranteed to one-tenth of one per cent accuracy. A low-energy high-speed telephone relay was given many trials under various conditions of operation and found extremely consistent and satisfactory for the purpose.

In conclusion it is considered, with such consistent operation of the stopping relay and the wide easily read scale of the Triplett meter as mentioned under the vacuum-tube-voltmeter explanation, along with other inherent characteristics of the complete testing set, that excellent field and shop results can be obtained on a variety of protective breakers and relays.

Fig. 6 shows comparative relay curves as obtained with the conventional "cycle counter" and the "Condenser Timer." At speeds above 0.4 sec. the cycle counter and condenser timer curves are very similar for the same values of overload on the same relay, but at speeds below 0.4 sec. as shown, the curves deviate from each other very noticeably and the curves of the cycle counter are irregular, while the curve of the condenser timer runs smoothly and evenly.

Outages Caused By Birds

By R. D. JEFFERSON
Idaho Power Co.

THIS report will attempt to present a picture of the relative importance and the frequency of outages on the Idaho Power Co.'s system directly attributable to birds; it will review the steps which have been taken to overcome such troubles, and it will indicate the results obtained.

Taking up, first, transmission lines having voltages of 44-kv. and above, it is significant that the Idaho Power Co.'s transmission lines traverse, to a large extent, desert country. There are relatively few small birds, but there are eagles, hawks and other large birds of prey and scavengers. The dearth of trees makes the power poles a highly favored vantage point upon which these birds are prone to perch. On lines having suspension-type insulators, there have been few outages caused by birds, but where pin-type insulators are used, it is possible for the wing span of the bird to be sufficient to start an arc to ground when landing on, or taking off from a crossarm. It is believed probable that most arcs are established during the take-off when the bird's wings may touch both the conductor and the ground wire down the pole. It is possible, too, that an arc may be directly established across phases.

Omitting mention of lines having suspension insulators, since outages on them attributable to birds are negligible, eliminates everything over 66 kv. Several of the 66-kv. and most of the 44-kv. lines have pin-type insulators. On these, most of the bird trouble has occurred.

One of the first epidemics recognized as being definitely attributable to birds took place in 1924, on the 44-kv. line between American Falls and Pocatello, an important line 23-mi. long across desert country and over one summit. The main source of trouble appeared to be a 4-mi. section over the mountain. In hopes that the crossarm would at least be made as uncomfortable as possible to roost upon, it was decided to experiment in this locality with an eagle guard consisting of a piece of wood mounted vertically on the crossarm a short distance toward the pole from the insulator, and from the top of this to the crossarm at the pole was attached another piece of wood. Dimensions were such that the top piece would assume an angle of about 30° with the crossarm. Ordinary lumber was used, anticipation being that within the four or five years it lasted success or failure of the trial would be established. The fact that the guards are still in position after some 16 years may be less remarkable than that they proved most successful.

In the meantime, riflemen as well as regular patrolmen have covered the worst portions of many lines and shot unnumbered birds. Portions of other lines have had eagle guards installed on them where most needed, with apparent success.

In 1936 the 90-mi. line between the Malad Power Plant and Boise was raised from 44 to 66 kv. Bird-caused outages at once became the major problem in the operation of this line. Just why this should happen has never been quite clear although the fact that 23-in. treated wood pins are relied upon to augment the small insulators may have some bearing on the case. By this time, however, eagle guards had definitely established their worth, and it was decided to install them on the whole line. Late in 1938 treated wood was made up in the Boise shop, and some 5,000 guards installed. The cost of these, made up, was 10c each. Installation cost was another 10c, 20c per guard—40c per pole installed. These crossarms were box type requiring, of course, twice the number of guards ordinarily required. The success obtained may be indicated, at least, by the following.

Boise-Malad Line Outages

Year	Birds	Unknown
1936 (5½ mo. at 66 kv.)	7	7
1937	10	12
1938	5	12
1939 (guards installed)	2	3
1940	3	3

Guards have been installed over portions of other lines, where needed, with the exception of one 66-kv. line 48 mi. long. This line is relatively unimportant; further, it has a steel bow-and-arrow type cross-arm structure. Eagles, apparently, are not so numerous in this locality or there would be more outages on this type of construction.

Records over any considerable time are not accurate enough to furnish statistical evidence of the results achieved, over the system as a whole, by the eagle guards. Specific instances illustrate the probabilities. Moreover, a particular unguarded line may operate satisfactorily this year but be a source of trouble next year until guards are installed. This has led to the belief that the birds are more or less migratory, not as to a general drift in one direction, but rather that they shift back and forth.

Substation outages due to birds have been confined to voltages over 4,000 except in one instance when a robin on a pothead just outside Boise substation caused an arc which burned off the conductors of this feeder and flared up into two feeders above where conductors were burned off also. Potheads similar to the one originating the trouble had been in use many places over the system for 10 or 12 years without causing trouble, but as a precaution two of the three leads from each pothead have since been taped to preclude future difficulties from this source.

The 6,900-volt, 12-kv. Y distribution has been a source of considerable trouble from birds. Step-type voltage regulators as delivered by the manufacturers had open spill gaps on the bushings. Two cases in which birds started arcs across these gaps resulted in damage to two bushings in each regulator. As a remedy, the lower part of the gap was turned down and Matthews Protectogaps, having one air gap in series with a deionizing type gap, have been installed on all such regulators. These gaps cost about $3 each plus installation labor.

One unusual outage occurred when a bird sorted directly across an ungapped 15-kv. oil circuit breaker bushing to ground causing a three-phase fault which damaged the three bushings on one side of the switch and burned through the switch cover.

Distribution Lines

Bird troubles on our distribution system first became pronounced in 1937. During this particular year we had installed some 400 new distribution transformers with cover-type bushings which were equipped with single open spill gaps. These gaps were of vertical design, the upper member being attached to the bushing cap, and the lower member being fastened directly to the transformer cover. The gap setting was 4¾-in.

Shortly after placing the first shipment of these transformers in service complaints began to come in from the field due to birds short-circuiting the gaps. Trouble men in refusing the cutouts would find dead sparrows, robins, magpies, and other types of small birds lying either on top of the transformers or at the foot of the poles. This became so serious that it was necessary to devise a bird guard.

This guard consisted of short pieces of No. 8 EHS Copperweld wire, bent to such a shape that it could be sprung around the center of the transformer bushing and would project out through the middle of the gap. Installation of these guards solved a portion of the trouble. However, they were prone to become loose and swing out of place in the wind. Even when they functioned properly we continued to experience some fuse blowings occasioned by two birds getting in between the gap terminals. Since 1937 these original gaps have been pretty generally removed from the transformers.

By the following year (1938) we had installed a large number of Westinghouse transformers equipped with the new screw-type bushings and these had been installed with bare lead-in wires. Serious bird troubles developed on these transformers by reason of birds perching on the loops of the lead-in wires and shorting across to the transformer cases which were grounded, thereby causing the transformer fuses to blow. This trouble has been eliminated to a large extent by using a short section of insulated wire as the lead next to the transformer bushing.

Since 1937 we have kept an accurate record of 6,900-volt transformer fuses blown by birds. These are as follows:

1938—184 outages on 6,700 transformers
1939—176 outages on 8,100 transformers
1940—185 outages on 11,500 transformers

From this record it is apparent that, while results have been attained, additional remedial measures must be taken. Our present plan is eventually to equip all 11-kv. distribution feeders with branch-line coordinated fuses, these being coordinated with both transformer fuses and substation breaker. Substation switches will be equipped with relaying to give instantaneous initial openings and reclosure. If the fault persists, there will be sufficient delay in the second operation of the switch to allow the fuses nearest to the point of the fault to clear before the switch opens again and locks out.

This program will, of course, take some time to complete over the entire system. However, as soon as a feeder is so equipped it is expected that the bird troubles as described above will disappear and field tests to date have proved that such will be the case. In the future, birds upon shorting the transformer gaps should cause an instantaneous operation of the substation breaker, thereby clearing the trouble before the fuse has time to blow.

In addition to transformer outages, during the past summer birds occasioned serious line outages in certain localities by causing branch-line fuses to blow. During the winter of 1939 and 1940 we installed, on somewhat of a trial basis, approximately 200 Kearney Trip-O-Link-Trip-O-Gap combination cutouts and lightning arresters. During the following spring and summer it became necessary to disconnect the grounds on these devices because of several sparrows alighting at once on an installation and shorting the phase to ground. This invariably blew the transformer fuse and in the majority of instances also took out the branch sectionalizing fuse. Before the 1941 bird season starts we expect to have guards protecting all such installations. These will consist of small pieces of screen placed on the helix springs of the device in such a manner that the protruding sharp points of wire will prevent the bird from alighting on these perches. It is believed that this will eliminate the trouble until such time as these particular feeders can be equipped with fast opening and reclosing substation breakers.

Other Systems

Other companies' reports of bird troubles on transmission lines show a remarkable range. Most of them have had no known trouble, with a few there have been rare instances, some have been confronted with a serious problem. Of these latter, some type of guard has proved quite effective in all cases. The most common, apparently, is a wooden bayonet sticking up between phases. One company uses a piece of stranded conductor with the upper end fanned out.

On distribution lines and transformers the experience of other companies is parallel to that of the Idaho Power, although with the majority it has been much less serious. The remedial measures taken have been very similar.

Substation troubles do not follow so general a pattern. Each system having trouble seems to have one particular type of equipment as a source. In most cases, however, these steps have been taken:

1. Potheads — Insulating tubes have been run over conductors until sufficient clearance has been obtained.
2. Equipment with bushings — Enclosed or double spill gaps have been installed, or larger bushings used.
3. Other equipment, conductors and bus structures—Larger insulators, increased spacing, or both, have been used.

NW Radio and Carrier Systems

By W. A. LEIDIGH, JR.
Portland General Electric Co.

PURPOSE of this report is to assemble and tabulate descriptions of both units and applications of emergency-radio and carrier-communication networks of member companies. Considerable interest was shown in questionnaire replies by those companies contemplating the installation or expansion of emergency radio service; therefore, the major part of this report will be devoted to the most recent of such applications.

A number of Northwestern utilities have made progress in emergency radio communication and in some cases have been first to make use of the service. However, those applications with coverage experience herein described cannot be considered as a cross section of the country.

Choice of Operating Frequencies

With two-way emergency-car trouble dispatching as the primary purpose of the communication network, one ultra-high-frequency mobile channel must be utilized. Mobile units, unless supplied with long, portable antenna systems, do not operate efficiently on medium high frequencies. Such applications are made only for line patrolling service in very mountainous territory where relatively short distances are to be covered and car to car transmissions are required. Therefore, the only choice of frequency band (medium or ultra high) applies to the operating channel of the central or fixed transmitter.

Keeping in mind the excellent and

efficient sight range propagation characteristics of the ultra-high-frequency band, its use should be confined to fixed stations where hilltop locations are available and comparatively level country is to be covered.

Where coverage area is located in hilly or mountainous country, and suitable ultra-high-frequency transmitter locations are not available, the more even and penetrating coverage characteristics of the medium frequency band will be most desirable. In this case the fixed station may be located in a central point regardless of elevation, and either at or close to the dispatching control point.

Questionnaire replies and descriptive contributions revealed that two Northwest utilities have had emergency dispatching networks in regular operation since 1939. Both networks represent typical two-way systems using medium high frquency fixed stations with mobile unit operation on one of the ultra high frequency channels. Being that the problems of both MHF and UHF operation are involved, a description of each system is contained herein.

Washington Water Power Emergency Radio Network

Reported by T. Wendell MacLean, radio engineer.

Washington Water Power in August, 1939, completed the installation of an emergency radio nework in the Spokane area under the call letters KQJD. The network consists of the one main station transmitter and ten two-way mobile units. Four of these are used by the bus transportation division and six by the line department of the electrical division.

Fixed Transmitter—The main station transmitter has a carrier power of 50 watts and operates on one of two frequencies, 2,292 and 4,637½ kilocycles, (the 4,637½ frequency is for daytime use only). The transmitting tower is of steel construction about 105 ft. high and mounted on the roof of the Spokane United Railways building. A ground network is provided by covering a portion of the roof near the base of the antenna with screen wire. The transmitter is located in the office of the S.U.R. dispatcher and is remotely controlled by this dispatcher and the system operator, whose office is about ½ mi. away, over two pair of leased telephone wires.

Two-Way Mobile Units—The mobile units consist of a 15-watt transmitter operating on a frequency of 31,740 kilocycles and a two-frequency receiver permanently tuned to 2,292 and 4,637½ kilocycles. The receiving and transmitting antennas are separate, the receiving antenna mounted in front and the transmitting antenna on rear of the cars and on top of the trucks.

The radio equipment for the line department has been installed in three light service trucks, two heavy line trucks and the line foreman's car. The mobile units used by the Spokane United Railways are installed in motorcycles and used by the road men who are instantly dispatched to fires, traffic accidents, and stalled busses.

Fixed Ultra-High-Frequency Receivers—The first receiver location was at the transmitter which is located on the roof of the Spokane United Railway's building. This location proved to be very noisy which limited effective range to approximately 8 mi. We have now installed a remote receiver on high ground in the Lincoln Heights district which has extended coverage from an 8 or 10 to about a 20 to 25-mi. radius.

The first receiving antenna is mounted on top of the transmitting tower and connected through a concentric line to the receiver, and line tuning unit located at the base of the tower.

The second receiving antenna is mounted on a wooden pole about 60 ft. above the ground and also connected by a concentric line to the receiver located in a metal box about 10 ft. above the ground. This location was determined after exhaustive tests on various proposed locations and proved to be clear of noise and other objections. The distance between this antenna and the dispatcher's and operator's offices is about 2½ mi. also connected with a leased telephone pair.

Operating Experience—The equipment to date has caused very little maintenance difficulties, the most prevalent source of trouble was due to faulty crystal holders for the receivers which were later replaced with an improved type of holder. The motorcycle units represent the greater portion of the service difficulties due undoubtedly to the terrific beating they get in the hard riding cycles and vibration from the motors.

Although no major emergencies have occurred since the installation of this equipment, it has proved its worth in minor cases such as wires down, feeders out, and important switching operations, as well as bad fires, traffic accidents and stalled busses for the transportation system.

Employees of Washington Water Power having amateur radio transmitting equipment have formed among themselves an emergency network covering the entire system. Mr. Dunn at the Nine Mile Plant is regional coordinator.

Further information on operating experience and an outline of the technical advantages of fixed station two-frequency operation may be obtained from T. Wendell MacLean of the company, Spokane, Wash.

Portland General Electric Emergency Radio Work

After complete study of available channel assignments and considerable development work, the emergency radio network of the Portland General Electric Co. was placed in regular service on Oct. 25, 1939.

The company's distribution network covers approximately 3,000 sq. mi. and serves more than 140,000 customers. Full coverage was not expected, but with slightly less than two years of operating experience, many surprising results were obtained. Further expansion with addition of other fixed units under control of rural district offices will no doubt be the solution to complete and dependable coverage.

Fixed Transmitter—Being primarily interested in emergency trouble-car dispatching and hydro-plant contacts from the fixed station the assignment at 2,292 kc. was chosen. The fixed transmitter is a composite, locally-built unit with a power output of 50 watts. Having complete control of transmitter design, we considered tube replacement costs. Popular low-priced tubes were used with a total replacement cost of $47 for the entire transmitter unit.

A one-quarter-wave vertical-type radiator is supported by a 125-ft. cedar pole set 12½ ft. in the ground, and painted in accordance with the requirements of the aeronautics authority. A 36-wire radial ground system is used to increase radiation efficiency and produce beneficial low-angle wave propagation. The transmitter is housed in a small wooden structure at the base of the pole, thus eliminating antenna feeder lines.

The station is entirely automatic with one control point located in the central office building at the system load dispatcher's desk, a distance of one mile from the transmitter. A second control point is now being installed at the field office near the transmitter, thus extending the service to the "repair" dispatcher.

The voice input to the transmitter is equalized to permit only those frequencies producing maximum understandability to enter the modulation system. Such practice is general where high fidelity is not required and maximum coverage is demanded from a low-power transmitter.

Mobile Receivers—At present 12 one-way emergency trouble cars are equipped with Philco 821-P crystal-stabilized receivers and can be called from their routine work at the instant a

breakdown occurs. Receivers with very high RF gain were tested but such gain proved unnecessary, except in remote locations, due to the signal-to-noise ratio at the average mobile receiving position. Dependable city-wide coverage is assured at any time however, due to the central location of the transmitter and "received" signals are far above any noise level encountered.

Two-way Mobile Units—Eight two-way mobile units are now in operation and other emergency cars are being equipped. The transmitters operate on the special emergency channel of 31,740 kc. with an output power of 15 watts.

The two-way units serve three passenger cars and five emergency line trucks. Two of the passenger cars operate from the main office and cover the entire system, being assigned to the line foreman and system field operator. The third passenger car operates from a district office located at an important load center and 45 mi. air line distance from the fixed transmitter. Three of the emergency trucks are dispatched from the main office and cover the metropolitan area. Two other emergency trucks work out of district offices covering areas from 25 to 50 mi. distant from the transmitter.

All emergency trucks are equipped with one-quarter-wave shunt-fed vertical radiators that are erected, by mechanical means, from inside the cab. Tests proved that the added height possible with this type of antenna installation decreased car body reflections and increased radiation efficiency.

The shunt-fed radiators installed on passenger cars presented more of a problem. Installations were made as high on the body as possible, which necessarily lengthened the lead from the transmitter to the shunt tap on the radiator. Considerable experimenting was done, but the talk-back coverage of the passenger cars is still slightly less than that obtainable with the emergency trucks using the same transmitter. Test facilities are now being installed to make possible more accurate adjustment of the mobile radiating systems and it is expected that this condition will soon be overcome.

All transmitters are interchangeable with "quick change" bases installed in all two-way cars. A spare transmitter is maintained at all times to take care of any breakdown that may occur during an emergency.

Two-way car installations include an oversize battery (180-amp.-hr., 20-min. rate) and in some cases special charging generator equipment, thus battery troubles have been eliminated and plenty of reserve power is available for long periods of emergency work.

Fixed Ultra-High-Frequency Receivers—One remote receiver for 31,740 kc. is located on Council Crest approximately 1,000 ft. above the surrounding country, and close to the center of the area to be covered. The audio output of the receiver is connected with the fixed transmitter control points, via rented telephone lines.

A second remote ultra-high-frequency receiver is located at Rocky Butte, approximately 10 mi. due east of the above location and 600 ft. above the surrounding country. A 70-ft. pole supports the one-quarter-wave RCA ground-plane antenna, and a 100-ft. concentric line connects the antenna to the ultra-high-frequency receiver. The audio output is mixed via telephone line with the audio output of the other remote receiver at the fixed transmitter location.

Hill and mountain shadings affecting mobile "talk-back" were noticably reduced when the second remote receiver was connected. In some locations, where spotty and reflected mobile unit reception was experienced, perfect sight range high signal level results are obtained. Observations made at the fixed transmitter on the input of both receiver lines were of considerable interest. It was noted that a mobile unit traveling in certain localities would transfer its "received" signal almost completely again within a few yards of motion. Fortunately, under these conditions, the output of the line mixer remained comparatively constant.

Maintenance and servicing problems are also simplified with two receiving points because the removal of one receiver does not completely disrupt the radio network. The same is true if severe storm conditions, to which such locations are exposed, should completely disable one receiving unit.

The high-volume so-called "rain static" that is received on ultra-high frequencies under certain atmospheric conditions is usually quite localized, and seldom affects both receivers at the same time. Thus, at least 80% of the available "talk-back" coverage can be maintained if suitable line mixing facilities are installed at the control points.

Operating Experience—Two-way coverage is obviously limited by either the fixed station range or the mobile transmitter range. The frequencies used in this network are widely separated in the radio spectrum. During a two-way contact, transmissions in one direction may be affected by conditions that do not affect transmissions in the other direction. Therefore, any statements on dependable coverage should be based on actual operating experience over a period of time.

In some cases, over comparatively level country, satisfactory contacts with mobile units up to 50 mi. air line have been made under midday conditions. Coverage of 30 to 35 mi. has proved to be quite dependable and regular contacts at this range are made each day.

These results are due largely to the excellent noise-free ultra-high-frequency receiving locations described above. At distances over 35 mi., the Council Crest receiver at the higher location does all the receiving of mobile transmissions.

All hydro plant communications depend on wire circuits at present. A carrier system was used in the past to supply a second communication channel to these plants but due to obsolescence and high maintenance costs, it has been completely disconnected. In view of the excellent contacts made at hydro plant locations with mobile units on several tests, fixed transmitter installations operating on ultra-high frequency are contemplated. Then, hydro plants may work into the existing radio system during emergencies with considerable more dependability than a carrier system for line down conditions.

The emergency radio network has been in regular service slightly less than two years, and no extreme storm conditions have been experienced. However, in several cases where strong winds caused many line failure outages on primary circuits and a number of transmission line interruptions involving loads up to 10,000 kw., normal service was restored from 30 to 45 min. sooner when radio facilities were used. Obviously, the value of such service to a large number of customers should not be underestimated, but where line repairs require more time with heavy line crews, the "time saved" percentage of the outage period is materially decreased.

In one case where a single-span transmission line outage had interrupted the service to a hospital, the dispatcher was informed that two persons were on the operating table and restoration of service was imperative. Such service was restored by two well directed radio equipped cars in 35 min., where the usual switching time would have consumed more than one hour.

Where human life is involved and human errors can be instantly corrected by the recall of a switching order before it is executed, and experienced emergency crews can be speedily dispatched to locations where hot wires are down, any reasonable investment in radio equipment is certainly justified.

During the period of operation, the dispatcher's log shows an average of 50 calls per 24 hours are handled from the fixed transmitter. Approximately one-half these calls are network continuity tests and mobile unit "in and out of service" reports with the remainder ful-

Table I—Northwestern Utility Emergency Radio Systems

Call Letters	Date Assigned	Units Land-Mobile	Operating Freq. kc.	Power Output (watts)	Service Use
British Columbia Electric Railway Co., Ltd.					
CY3L	1937	Fixed	3,057.5	200	Dispatcher to plant
(communication with local telephone company public service station) on			3,270		
Montana Power Company					
KQIA	1939	Portable	2,726	20	Point to Point
KQIB		"	"	3	
KQIC		"	"	3	
KQID		"	"	3	
KQTW		"	"	30	
KQTX		"	"	12	
KQTY		"	"	12	
KQTZ		"	"	3	
KQUA		"	"	3	
Northwestern Electric Co.					
KAGW	1938	Portable-mobile	31,460	8	Point to Point and KQEB
			31,740		
KAGX		Portable-mobile	35,140	8	
Portland General Electric Co.					
KQEB	1939	Fixed	2,292	50	Dispatcher to mobile and plants
(8 two-way portable-mobile)			31,740	15	
(12 one-way mobile rec. only)					
Puget Sound Power and Light Co.					
KAQR	1938	Portable	2,292, 2,726	2	Point to Point and line patroling
KAQS		"	"	2	
KAQT		Portable-mobile	" "	15	
KAQU		Portable-mobile	" "	15	
Washington Water Power Co.					
KQJD	1939	Fixed	2,292, 4,637.5	50	Dispatcher to mobile
(10 two-way portable-mobile)			31,740		

filling the emergency requirements of the station license. In many cases, 75 to 90 calls per day have been made and during one storm, a peak of 100 calls were recorded in an 8-hr. shift.

As closely as can be estimated at the present time, 90% to 95% of all fixed station calls are completed.

Out of 13 companies in the Northwest, six are engaged in emergency radio activities. Outside of the two mobile dispatching networks herein described, three other companies are using portable and portable-mobile units with working coverage distances of from 12 to 200 mi. Table I shows two such systems working on medium frequency channels and one other using the ultra-high frequency channels. The latter service works into the KQEB network with one unit and excellent cooperation is experienced from both sides.

Some interest was shown in network intercommunication tests, where proper receiving equipment is available, to determine the possibility of a power company long-distance relay network. Since large power systems operate more or less as a unit through transmission-line ties, expanded radio communication facilities may prove to be essential for extreme emergencies and national defense.

All services are listed in the tabulation under the company name, and as complete details of operating experience for each service were not available at this writing, it is suggested that further information be obtained from the person in charge of the system.

The attached tabulation of carrier current systems (Table II) is quite complete and contains most of the information reported.

A duplication will be noted in the report of Washington Water Power Co. and Montana Power Co. on the Spokane-to-Morony carrier system; it seems that these units are jointly operated by the two companies.

The application of carrier for communication only seems to be limited to long transmission lines where distribution systems are widely scattered and wire circuits are either too costly or not available. The trend toward monthly rental of toll facilities from existing communication companies is increasing; thus transmission line routes are eliminated for either wire or carrier circuits, resulting in more dependable service during line-down or emergency conditions.

The applications shown list other communication uses, and the two carrier systems operating over telephone circuits were developed by the Northwestern Electric Co. for a special telemetering service.

Table II—Northwestern Utility Carrier Systems

From	To	Miles	Make	Freq. Kc.	Power (watts)	Coupling	Service
Idaho Power Co.							
Boise	Caldwell	27	Fred M. Link	140-82.5	5	Ph. to Ph.	Communication
Caldwell	American Falls	222	Fred M. Link	62.5	25	Ph. to Ph.	Communication
Caldwell	Upper Salmon	110	Westinghouse	100	15	Ph. to Ph.	Pilot relaying and remote trip
Montana Power Co.							
Spokane	Morony, Mont.	400	Westinghouse	84	150	Ph. to Gnd.	Load control
Grace, Idaho via Anaconda to Butte, Montana		300	Fred M. Link	73	25	Ph. to Ph.	Com. and relaying
Grace, Idaho	Anaconda	277	General Electric	38	25	Ph. to Gnd	Communication
Burke, Idaho, via Thompson Falls, Dog Lake, Kerr Dam, St. Ignatius, Missoula, Nimrod, Butte and Morony		365	General Electric and composite	55	100	Ph. to Ph.	Communication
Northwestern Electric Co.							
Ariel	Vancouver	27	Composite	43	10	Tel. Circuit	Metering
Camas	Lincoln Station	22	Composite	43.5	14	Tel. Circuit	Metering
Pacific Power & Light Co.							
Condit Plant	Union Gap	76	General Electric	..	50	Ph. to Ph.	Communication
Puget Sound Power & Light Co.							
Seattle	Rock Island	160	General Electric	56	10	Ph. to Ph.	Communication
White River	Seattle	30	General Electric	78	..	Tel. Circuit	Communication
Chelan	White River	150	General Electric	86	10	Ph. to Gnd.	Load control
Washington Water Power Co.							
Spokane	Morony	400	Westinghouse	84	150	Ph. to Gnd.	Load control
Chelan	White River	150	General Electric	86	10	Ph. to Gnd.	Load control
Chelan	Holden Mine	53	General Electric	60-105	10	Ph. to Gnd.	Communication

Note: Duplication in listing same carrier system under two company headings indicates joint use.

This Industry Is Ready

Convention of Pacific Coast Electrical Assn. reviews the industry's preparedness for national defense or war and its ability to contribute to the welfare of America during and after the present emergency

IMPRESARIOS of the successful convention at Coronado, President Clyde E. Houston, vice president in charge of commercial activities, Southern California Edison Co. Ltd., and Convention Chairman, Joseph A. Long of the same company. Theirs was the big job done

WITH its sessions staged against almost constant background noises of diving and droning planes from nearby aircraft factories and training bases—as if to keep ever fresh the thought of the defense emergency—the twenty-fourth annual convention of the Pacific Coast Electrical Association held at Hotel Del Coronado on San Diego Bay, May 21-24, reviewed the past and predicted the future contributions of the electrical industry to human economic, industrial and social progress. From President C. E. Houston's opening address to the closing admonition of Chrysler's Vice-president Verne Orr that "helping another helps oneself," speakers pointed to new and greater challenges and opportunities for service and progress. Many of these tied directly into the defense program; others were aimed at the post-war period.

The 600 plus men and women attending the convention (fully 25% more than had been hoped for) were impressed by the well balanced and interesting fare of business and entertainment provided by Edison's Joseph A. Long, general convention chairman, and his corps of capable committees. The program combined the essentials of a convention and section conference. There were three half-day general sessions and two half-days of conclave meetings under the direction of the Business Development, Engineering and Operating and Administrative Services sections. Feature of these latter was a sales conference attended by 150 San Diego County electrical dealers, in which current and future merchandising problems were discussed by a group of experts.

Variety was added to the program by the inclusion of speakers from outside the electrical industry who brought a fresh viewpoint of some of the industry's contributions and opportunities. Others warned of the difficulties entailed in speeding up the national defense program — material shortages, priorities, scarcity of skilled men, increased taxes and costs. Yet none were pessimistic, either as to the immediate outlook or as to the future.

President Houston set the convention theme with these remarks in his presidential address*:

"Great as have been the electrical industry's contributions to past progress, we do not know nor can anyone guess what further developments lie ahead. It is reasonable to predict that out of the defense research we may develop many new and now unknown devices and applications. We can be assured that there is nothing static about our business. Electric power for defense industries isn't something that is 'on order.' While we drive with every force at our command toward the goal of complete and adequate national defense, we hope we will be enabled through the genius and resourcefulness of our people to lead the way to industrial and economic stability when the days of peace come again."

Speakers before the general sessions and in the conclave group meetings seemingly took their cues from that thought. In the pages that follow will be found abstracts from some of the major addresses, reports on others and resumes of the discussions in the group conferences.

Over the three general sessions of the convention, held in the historic ballroom of the old and picturesque hotel, the two association vice presidents and the president presided in turn. Sam E. Gates, Los Angeles district manager, General Electric Co., vice president, introduced the theme of the convention, "The electrical industry's contribution to progress," as he presided over the Wednesday afternoon opening session.

Vice President K. M. Ryals, Stone Ryals Electric & Manufacturing Co., San Francisco, conducted the Friday morning session and President Houston the closing session, Friday afternoon.

* See page 47.

For Contractors

Spokesman tells NECA's constructive program

By CLYDE L. CHAMBLIN
Manager, California Electrical Construction Co.

IN THE LAST twenty-five years, the electrical industry has been an outstanding example of what a united effort will do in bringing about a higher standard of living. Instead of its four major divisions pulling in four different directions, as many of us have seen, for years we have been drawn together by our common cause until today those who would tear down and destroy our unity of purpose are being rapidly eliminated.

From an unknown quantity, the electrical contractor has grown to a point where in 1939 a survey of 3,800 contractors showed they did a total business of $235,600,000. Surely this volume lifts the contracting branch of the industry out of the carpet-bagger class or there would be no such figures possible. Of this amount, some $21,000,000 was for residence work alone, which is of course the place that the standard of living is most affected.

You will recall the continuous battle the whole industry has had with the contractor who was constantly tearing down the job instead of selling more

convenience to the public. Through the Red Seal and Adequate Wiring programs this type of contractor is being rapidly eliminated, and today we have countless contractors selling on adequacy rather than price alone. We also have today contractors in every community who are well equipped with personnel and facilities to serve the public in the best possible manner. It is from this group that the National Electrical Contractors Assn. is largely made up.

I feel the time has arrived when the contracting branch of the industry does not have to apologize any longer for its indifferent attitude. There is just as high a percentage of progressive, constructive thinking men in this branch as will be found in any other branch of the industry. The evidence of this is found in the program of our national association.

Among the activities is a Labor Relations Committee for the handling of our labor problems. In view of the fact that approximately 50% of our volume is labor, it can readily be appreciated that this is as vital a problem with us as material. In fact, it is more of a problem, for the wireman is in constant touch with the public, and is a tremendous force for constructive or destructive thinking. We believe that by a closer cooperation with our labor we will not only lessen disagreements but open the way to developing a better understanding of the problems of our business.

The successful electrical contractor of the future will be the one who is constantly studying the needs of his selected customers and who has developed himself and his organization in the science of selling his service to the customer. Through our sales development studies we will learn "How to Sell," "Where to Sell' and "What to Sell."

Every intelligent sales program must be built upon basic facts and past experience of the industry. Factual industry statistics are the basis for measurement of the industry and are essential to the success of every individual member's business. Through our statistical committee we are gathering data as to the volume of our business in the various fields we survey.

One of the greatest problems facing the contractor today is how to reduce the cost of electrical installations, so that the public can and will afford to enjoy more of the benefits of electricity. One of the ways this can be brought about is by the elimination of the multiplicity of needless wiring materials and methods. This can be done by simplification and standardization of materials and by the establishment of uniform wiring practices.

Unless the entire industry joins with the contractors in a sincere study of this problem, there is not a chance for a reduction of installation costs to the consumer. Our committee is making a careful and thorough study of this situation but must have the cooperation of the entire industry to make any simplification of methods effective. The costly materials, methods and rules are of the industries' own making and it is up to the same industry to correct any mistakes that penalize the public needlessly.

Public acceptance of the services of the electrical industry demands public confidence that the industry is seeking to provide the highest development of the service at the lowest possible cost. Rules for installation or types of materials that cannot be justified to the enquiring customer will not increase confidence that we are sincerely trying to reduce costs.

To sum up then: the organized electrical contractors of the country are fully alive to their responsibilities, and without question are contributing their part to the progress of the industry. This does not mean that there still is not much to be desired in arousing more contractors to their responsibilities.

For Manufacturers

Users benefit from developments in all equipment

By E. O. SHREVE*
President, NEMA

ALL INDUSTRY, including the electrical, has contributed far more to the social and economic advance of our country than the general public understands or realizes. The crashing of empires all about us and the rapidly changing world conditions suggest that we must be more interested in what we can contribute today, but a brief outline of past progress may suggest our fitness for the tremendously important job we now have before us.

From generation through distribution to utilization the manufacturing industry has been motivated only by the ideals of wishing to conduct a business-like commercial enterprise and to serve well the interests of the public. As generators and turbines have increased in size, efficiency and reliability, rates have gone down. And other apparatus has improved as well. In every case it has been the ultimate user who has benefited.

In the industrial field motors have been steadily improved in reliability, operating characteristics, efficiency and cost. Many outstanding contributions were made in 1940. In 1895 a 1/3 hp. motor sold for $80. Today, a better, more reliable, more efficient motor sells for as little as $8. In 1900, a 1-hp. motor cost $163. Today, much improved in every way, it costs $41.

One of the latest contributions to commercial and industrial wiring was the production of the new thin-wall insulated conductors which opened large new opportunity for sale of equipment and greater electrical use in old buildings.

Electronics has but recently come into the picture and has already made large contributions. One of the most versatile is the photo-electric cell, popularly known as the electric eye. Its possible applications seem to be without limit. In the future of electronics probably lie some of our greatest opportunities.

Electric welding has taken its place in production in a large way. The defense program will advance this activity very rapidly as its effectiveness in the fabrication of ships and other steel equipment is recognized.

Fluorescent lighting, one of the newest contributions, has developed with lightning speed. Strangely enough, while this new market is expanding, it is not causing apparent shrinkage in the incandescent lamp output. Last year approximately 600 million large incandescent lamps were produced — the largest year in the history of the lamp business, a gain of around 75 million lamps.

Air conditioning has seen a very substantial advance in type of equipment, operating efficiency, cost and public acceptance.

The development of equipment to serve the consumer field, with the exception of the lamp, has been of fairly recent origin. The oldest item, the lamp, has made notable contributions. The first lamp sold for $3. Within a few years the price dropped to $1.50 with electric rate at 25 cents per kw-hr. Today's 100-watt lamp costs but 15 cents and gives 10 times the light and operates on an electric rate of much below 4 cents per kw-hr. Putting it another way, the modern lamp at 1/20

* An abstract.

the cost, gives 10 times the light, or an overall improvement of 200 times.

Electric ranges have been tremendously improved both in efficiency and appearance but sell today for less than half the price in 1926. Electric refrigerators began to have general acceptance in 1926. Today's cost is from 25 to 50% lower for a better product. Efficiency has improved so much and electric rates have decreased so much that nearly five refrigerators can be operated today for the operating cost of one in 1926.

All of these appliances and devices by their rapid development of efficiency and low cost have enabled more and more people to enjoy their ownership thus contributing to decreased drudgery in the home, a happier, better living and much better social conditions.

Today, there is not a single industry which is not materially dependent upon the electrical industry for its operation. Therefore, it is easy to comprehend that the electrical manufacturing industry must form a very vital part of the defense program. We not only contribute in a direct way very substantially, but we are called upon indirectly to help every other industry do its job for defense. We have already undertaken to produce well over a billion dollars worth of material direct for defense. We have added thousands of men, and we will add and train thousands more. We are adding to our plants at a cost of between 100 and 200 million dollars.

It is a source of pride that probably no other industry has been entrusted with as wide a diversity of equipment to produce as has the electrical manufacturing. It includes turbines and gears for ship propulsion, electric drives for submarines and tanks, naval gun mounts and ammunition hoists, searchlights for aircraft and other purposes. Some of them 60 inches in diameter, delivering 800,000,000 candle power, radio transmitting and receiving apparatus, anti-aircraft lighting systems, turbo-superchargers which permit airplanes to operate with full power at high altitudes, propeller pitch control devices, motors and special generators for airplane service, many instruments for air service, ordnance control equipment of many sizes and varieties, guns, shells, switchgear, wire and cable and many other devices and types of equipment.

The spirit, as I see it, is to do the defense job regardless of profit and to do it as quickly as it can be done. I know that our industry will meet the challenge.

INFORMAL discussions, such as this between A. E. Wishon, assistant general manager, PG and E, W. C. Mullendore, executive vice president, Edison Co., and E. O. "Bill" Shreve, vice president, General Electric Co., Schenectady, were numerous

For Utilities

More electricity at even lower rates to consumers

By W. C. MULLENDORE*
Executive Vice-president, Southern California Edison Co.

WHAT of your stewardship, the public may ask? What have you done with your marvelous discovery of the means of distributing electric energy from central stations? Have you made it available in ever-increasing quantities to an ever-increasing number of people? Have you improved the instrumentalities for its service and reduced its cost to those whom you serve? If we can make satisfactory answers to these and similar questions, and we believe we can, we should successfully pass the test of our stewardship.

In answering these questions we cannot accurately apportion the credit for the incredible progress of the industry as a whole among its various elements. The engineers and scientists, the managers and workers of the manufacturers, and the utilities in particular have worked so closely together and have jointly made so many contributions that to attempt any such apportionment of credit would be both unfair and confusing. I shall here attempt to give only some typical figures bearing particularly on the distribution to and utilization by the ultimate consumer of energy which is now made available to him by the combined efforts of all elements of the industry.

Starting with the few hundred watts of commercial lighting furnished to the handful of venturesome customers of the Pearl Street station, the applications of this new form of energy spread slowly at first but cumulatively, particularly since the beginning of this century, until finally it was a principal factor in the greatest industrial revolution and the most marked advance in the standard of living that this world has ever known.

The preeminent contribution of our industry has been a hitherto undreamed of supply not only of energy but of energy under such perfect control and so instantly available in any quantity desired at almost any point desired that humanity has been given at least a glimpse of the possibility of what has been called the solution of the problem of production.

From a small beginning in 1882, the distribution of electric energy has grown in the 58 years intervening until at the end of 1940 the total ultimate consumers served in the United States by 100 per cent of the industry was 30,138,494, of which approximately 25,500,000 were residential customers, urban and rural, and 4,442,000 were commercial and industrial. These figures indicate that there are about five-sixths as many residential and domestic customers of electric utilities as there are family units in the United States.

In the decade from 1930 to 1940 the growth of population in the United totalled 8,894,000. In that same decade the growth of ultimate consumers of the electric utilities was from 24,555,000 to 30,138,000.

The growth in total sales to ultimate consumers in the same period was from 75 billion to 118 billion kilowatt-hours. In 1926, the parity year to which reference is made in measuring agricultural prices, the average revenue per kilowatt-hour for residential service by

* Minor extracts from an address to be printed in the July issue.

the electric utilities was 7 cents, and the average usage per residential consumer was 430 kw-hr. annually. In 1940 the average rate per kilowatt-hour for residential consumer was 3.86 cents, and the average consumption had risen to 945. In other words, the average rate in 1940 was little more than half that of 1926; while the consumption had more than doubled.

To supply the total of more than 30 million customers of all classes, the utilities of this country generated in 1940 about 145 billion kilowatt-hours of electric energy. Our utilities furnish, according to the last census of manufacturers, 58.4% of the power used in manufacture in the United States. You are all familiar with the story of mass production in the United States and with the fact that the American workman has at his command, and to assist him in doing his work, an average of 5 hp., or the equivalent of 50 slaves for each industrial worker, and you also know that this aid from the mechanical and electrical slaves is twice that enjoyed by the workers of any other country in the world.

In these and similar figures lies the outstanding story of American progress and the explanation of why the American workman can, and does enjoy a standard of living twice that of any other workman in the world, and why, despite the vastly higher wages paid, American industry is able to compete in the markets of the world.

National Slants

Edison Electric Institute conference reported upon

R. E. FISHER, vice president in charge of public relations and sales, PG and E, chairman of the Edison Electric Institute Business Development Section, opened the Friday morning session with a comprehensive report of the annual meeting of that section in Chicago in March. K. M. Ryals, Stone-Ryals Electric Co., San Francisco and a PCEA director, presided over the morning session.

The new importance of the power sales engineer in connection with national defense service was realized, Fisher said. REA, he reported is being used contrary to its original conception in some places as an instrumentality for government competition. For the first time the national meeting had held a separate home service conference. Fisher himself had sounded a keynote that the bread and butter business of the utilities must be carried on parallel to the defense effort to hold stability after the shock of war is over.

Other subjects covered included the housing shortage situation in defense industry centers, the substitute materials, turning of appliance servicing more to dealers, activities of the Better Light-Better Sight campaign and Modern Kitchen Bureau. O. R. Doerr, general commercial manager, PG and E, had reported on the Northern California Electrical Bureau's commercial building rewiring program. Fluorescent lighting was held to be a challenge still, because half of it is still being sold merely to reduce bills rather than improve lighting. President Kellogg, devoting his time to the defense program, had declared there was no threat of power shortage in America except in a few temporary instances.

New Tools

New and more effective materials and equipment

By H. V. PUTMAN
Manager, Transformer Division,
Westinghouse Electric & Mfg. Co.

OUR engineers have long had a warm spot in their hearts for West Coast business and industrial leaders. Basically, it's because you are essentially pioneers on two counts. First, you folks always seem to need the biggest of things; second, you eagerly welcome new engineering ideas.

So you've won a natural regard from all our experts—because if anything pleases them more than a man-sized challenge to push back existing engineering frontiers, it is to find a friendly soul that gives their new developments a real chance to show what they can do on the job. And the nice thing is that as individuals you seem *just* as interested in the operation of a little reverse-cycle room cooler that heats as well as cools your bedroom, as in how huge generators have been ingeniously cured of vibration.

Although herculean chores stir imagination, not many of us will ever use one in our every day business. But new developments possibly do form a common denominator of interest for us all. To me, all engineering developments seem to do one (or more) of four things for users—that's you! (1) Speed your production; (2) Increase operating reliability; (3) Give you more for your money; (4) Make your work more pleasant—or safer. Because your work is diversified, I'll try to pick developments in each class that may have a direct bearing on many of your western industries.

At the moment the eyes of industry—and America—are focused on upping production. And it is going up—often as a result of newly applied "tools," such as induction heating.

Split-second heating using power at from 1000 to 130,000 cycles (and up) depending upon work to be done—speeds production and usually turns out a better product at lower unit cost.

In contrast to induction heating that will find a home in varied industries, there are special tools, such as the ignitron, which are proving equally important as they hasten the flow of key defense materials, like aluminum. The ignitron is a rectifier with the knack of producing floods of direct current with unmatched efficiency—a development of surpassing significance to western chemical, electrolytic, and allied industries.

A universal tool in most defense plants for bettering production is fluorescent lighting. Recently, your Vega Airplane Company (subsidiary of Lockheed) at Burbank ordered 35,000 Westinghouse fluorescent lamps for its new airplane plant.

An interesting sidelight is sorting metal scrap more quickly and accurately. Molybdenum, tantalum, stainless steel, and nickel scraps are being identified and separated positively and quickly by characteristic color tinges appearing on the different metals under daylight fluorescent lighting. Recently from salvaged molybdenum having a value of about $700 in its pure state, an additional $100 worth of tantalum was recovered through the use of fluorescent lighting.

Speaking of high voltage transmission lines, a new engineering idea is being tried for the first time to make them even more trustworthy. Briefly, in case of ordinary trouble, instead of opening all three phases as customary, only the single faulted phase is opened and then quickly reclosed. This lets two phases continue to carry load and synchronous machines remain in step.

In Defense Plants

Relatively, the transmission of power at high-voltage by utilities is almost 100% interruption-proof. The big danger of outage seems to be the low-voltage circuits in the plants themselves. Secondary net-works—like those used in cities—seem to be the answer for the increasingly concentrated load in big airplane factories, manufacturing plants, power house auxiliaries and ocean liners. Extremely reliable and practically sabotage-proof, they meet changing load conditions with ease and often have lower installed cost.

Blackout plants like those being built

LEADERS—Among the convention executives and committee and section chairmen were: Emory Wishon, PG and E assistant general manager; W. C. Mullendore, Edison's eloquent executive vice president; Hance Clelland, president of California-Oregon Power, at Medford, the farthest northerner; Harry P. Field, Hawaiian Electric's farthest westerner; Al May, San Diego G & E, in charge of hotel arrangements; R. C. McFadden, Edison, chairman, Business Development Section

in the South and here on the coast, have brought new operating reliability problems—for example, what to do about air conditioning? The answer is a unit "zone system." Such zone systems will increase the reliability of air conditioning to be installed in two new "blackout" defense plants—the Douglas Aircraft plant in Long Beach, (Calif.) and the U. S. shell factory in Gadsen, Ala. Enemy bombers would find it nearly impossible to put the new system out of commission.

The new non-bounce contact is a silver chamber, conventional except that—and here is its secret—it is hollow and is partially filled with grains of tungsten. When the moving contact is stopped the interfriction between the tungsten grains absorbs the energy of impact which ordinarily has to be dissipated by repeated bouncing. Carrier-current relaying has been the principal beneficiary of this improved contact operation. Interestingly, the same principle cured the vibrating frame of a big generator. Steel pockets were welded on each corner and then half filled with sand which absorbed the energy, leaving the machine shakeless.

Portable substations for short-lived loads like circuses, or banks of capacitors, on wheels is an allied advance.

In the generating field engineers are sapping the inherent vibration of two pole rpm turbo-generator by flexible supports to raise the limit of size in high-speed, low-cost 3600 rpm machines.

Geared diesel ships now use electromagnetic couplings, which iron out the torque pulsations of the internal-combustion engines before they reach the gears. The gears are thus spared the sudden shocks of engine-torque variations, providing quietness and longer life. The coupling also makes it possible to use multiple diesel engines of medium speed, geared to a common propeller shaft.

Hipersil is an improved magnetic material which, used in transformer cores, has one-third greater flux-carrying capacity than the best conventional silicon steel. In carrying this increased flux it requires no more magnetizing force and its losses will be no greater. Furthermore, its sound-producing property is reduced so that increased magnetic flux causes no increase in sound level. In its first application it has reduced size and weight of distribution transformers as much as 25 per cent; has facilitated reduction of copper losses some 10 per cent and thereby increased shorttime overload capacity.

And so the tale of engineering goes. And we can pretty safely predict it will continue. Small and powerful as present-day machinery seems, we shall see machines still more compact and more powerful; still more ingenious; still more efficient in producing work on less and less fuel.

Miracles in Sound

Technical improvements in communication are shown

"MODERN MIRACLES" was the title given a popularized and instructive discourse and demonstration of new telephone laboratory developments by Dean T. Smith, supervisor of public activities, Southern California Telephone Co., at the Friday morning session. In contrast he told of Alexander Graham Bell's circuit of one voice on one wire as against present carrier current circuits, 16 voices to one pair of wires, and the coaxial cable, with a possible total of 750 voice channels on one copper tube and one wire.

He also told of vacuum tube developments, showing one tiny enough to be wound into a cable. He illustrated magnetic materials such as permaloy and the quartz crystal filter and ended his program by demonstrating the speech scrambler used to give privacy to trans-oceanic radio telephone conversations, the artificial larynx by which those with impaired vocal cords may speak synthetically, and finished with a demonstration of an adaptation of the same idea. The latter was called the Vokider. With it, such recorded sounds as train whistles or that of any musical instrument, introduced into the mouth through a tube similar to that used with the artificial larynx could be shaped by the mouth and throat into speech or made to say something.

Work Hot Lines

Gadgets for live line maintenance insure service

ONE of the most dramatic as well as most useful techniques developed by the private utility companies has been that of working on "hot" or energized lines, even of voltages as high as 220 kv. with special long distance tools. H. W. Tice, manager of operation, Southern California Edison Co., presented a new color movie of such live line maintenance work recently completed by the company as part of its employee educational program.

The movie was taken under actual operating conditions under the direct supervision of the company's safety engineer. It showed first the ingenious tools that have been devised to work on wires and insulators from a safe distance by means of long especially treated sticks. Uncanny in its effectiveness, for instance, was the skill with which the "mechanical hand" was operated.

By means of such methods Tice declared that when done by trained men working on hot lines was even safer than former methods in which the lines were de-energized. In 17 years, on lower voltages, there has only been one personal injury. The advantages of these methods, especially when defense production demands continuous service without interruptions, were enumerated

by Tice. Hundreds of phone calls, intricate coordinated switching and load dispatching, and even steam plant operation were eliminated when the high lines from hydro plants could be serviced without shutdown.

Radio Freedom

New edicts threatens to emasculate popular service

By DON E. GILMAN*
Vice President, Western Division,
National Broadcasting Co.

THE American audience is well pleased with American radio. That is evident not alone by the receipt of millions of letters of approval received by networks and their sponsors but more particularly in their purchase of radio sets. Last year I believe was the largest year in the history of radio for the number of sets manufactured and sold. To our knowledge there has been no important complaint about the conduct of radio to the national authorities. The clients we are serving are satisfied. If they were not, they are free to discontinue their advertising on the termination of their contracts. The advertising agencies planning these great radio campaigns are equally satisfied. Great progress has been made in radio entertainment, radio programs receiving new highs in listening audiences.

Yet despite this universal approval radio has now come in for a set of regulations through the Federal Communications Commission which if enforced will destroy completely this fine system of broadcasting which has been developed in America. Were there any serious complaints or were the American broadcasting systems arrogant, domineering or prejudiced, there might seem to be reason or explanation of such a radical step. The Federal Communications Commission through an order issued early this month would force the National Broadcasting Co. to dispose of its Blue network. It would further ban exclusive network affiliation contracts with local stations, would destroy the optional time now maintained by contract with the stations, would compel the National Broadcasting Co. to sell a number of its stations, although it only owns ten of the 228 stations composing its networks. The results of this order would be to destroy the present *modus operandi* of commercial radio and would probably take from the American people many of the fine programs which they have learned to enjoy and appreciate.

Of all the contributions the electrical industry has made to the American home, such as improved lighting, heating, labor saving devices, none in my opinion has had the far-reaching benefits of radio. Keyed to the modern tempo, bringing current events and national affairs to the very fireside of the American home, it is a contribution to culture, entertainment and happiness. Years ago in my earlier speeches on the subject of radio broadcast I stated, and can repeat here just as forcibly, that of all the great modern inventions radio alone attracted the user to his own fireside. The automobile, the airplane, the telephone, motion pictures, all of the inventions and devices for man's use increased the tempo of his living and tended to take him away from that center of his life which all the philosophers and poets and writers have maintained was the base of culture, education and morals.

In recent years radio has become the forum for political discussion. Where great mass meetings, torchlight processions and public speeches marked political campaigns in America, these have been replaced today by the radio which brings the mass meetings into the American home.

In the current war crisis no medium is rendering service to the American people or to the world as effectively as radio. Unfortunately, in the dictator controlled countries of Europe it has ceased to be a democratic function. There the dictator has taken from the people the right to listen at will and punishes by fine, imprisonment and even death those who listen to radio stations of enemy or other countries. At the same time they recognize the importance of radio as a disseminator of information, using it exclusively for spreading misinformation to this country and to South America as well as to other countries. As an antidote for some of this, we have developed an exclusive program of foreign language broadcasts intended to give correct and unbiased information to the Americas and some of these broadcasts are directed to the eastern hemisphere as well. I have yet to hear of a single criticism of the American broadcasts as being biased propaganda. The news is reported without censorship other than that exercised by the warring nations, but with no censorship of American news.

Here also, as opposed to most of the other nations in the world, radio has been left for private development. Characteristic of the American economy, this development has gone forward along broad lines of competition and service. The Federal Radio Act, which creates the Commission which is supposed to regulate this technical development, has been broad in its conditions and has given the radio operator wide discretion in the acceptance of his material. In only one particular has it made specific requirements of him. This requirement has been in the field of political debate. Under the Federal Act a radio station must extend equal privileges to all candidates for public office if certain privileges are given to one of them. This has been misinterpreted to mean that radio stations must give all exponents of varying phases of thought equal opportunity on the air. This is not true as the law applies specifically to candidates for political office.

However, as I said earlier in my talk, it has been characteristic of the sportsmanship and fair play of American radio operators that they have extended their facilities with equal consideration for all sides of every great public interest. I do not know of a single instance where the operator of a radio station or a radio network has used his facilities editorially to expound his own viewpoint or bias on a public question.

The electrical industry can be very proud of this child of its scientists and laboratories. It can be proud that in America its development both technically and morally has reached its highest phase. A great development of this kind is worthy of the industry which brought it forth.

* Abstracted.

"Hold Your Hat

You ain't seen nothing yet in taxation"

By N. BRADFORD TRENHAM
Executive Secretary, California
Taxpayers' Assn.

THERE is almost unanimous agreement on the part of Federal, state and local officials that ordinary, non-military expenditures of government should be held to a minimum at this time. One hears very little of the talk of a few years ago in favor of spending public money freely to provide employment. The director of the Federal Budget is recently reported to have said, "During this period of the defense program, every effort should be made to balance state and local budgets and to cut down activities, particularly public

* Abstract of extemporaneous remarks.

LIVE LINES—At the top, above, H. W. Tice, Edison manager of Operations, who told of hot line maintenance, with Edison's W. R. Frampton, meter superintendent. Center picture, two of the Administrative Services leaders, F. C. McLaughlin, Edison Co., chairman Accounting Group, and S. W. Murray, Westinghouse Supply Co., vice chairman, of the Section. Bottom, from Pittsburgh came Allis-Chalmers' Ralph Beard who is with Frank Angle, San Francisco district manager of Allis-Chalmers

work projects which conflict with the defense program."

In California, when the executive budget was submitted to the legislature in January, the governor said, "In view of the uncertainties in present world affairs, every effort must be made to husband the financial resources of state government. . . ."

Local officials are making similar pronouncements but the taxpayer will feel much better when he sees these laudable sentiments translated into action.

In spite of all the care and economy that all patriotic officials and citizens exert during this national defense effort, the tax burden will be onerous, painful, and fraught with danger, but it will be still worse unless every effort is put forth to avoid waste and extravagance, to remain calm and discriminating, to spend public money only for justifiable purposes.

In dollars and cents, Californians will be confronted with a total Federal, state and local tax bill in the year beginning July 1, of between $1,400,000,000 and $1,500,000,000. It is estimated that $750,000,000 of Federal tax collections will be paid during 1941-42 in California. This will be two-and-a-half times the Federal exactions of 1939-40. Even if there is no increase in state and local collections they will nearly equal the Federal bill.

Californians must gird themselves to pay about $4,000,000 a day in the coming year, which is equivalent to one-half million dollars for each regular working hour. No one should be deceived by the types of taxes used. They will all have to come out of production and savings, regardless of how they are collected. They will fall on California families at the rate of $720 per family for the year or $2 per day per family.

A year from now it is safe to predict that all Californians will be tax conscious. Forewarned is forearmed. Those who make preparations in advance to meet their tax bills will suffer less than those who make no preparations.

Since the only effective way to offset the Federal increases is by getting along with less state and local expenditures, it behooves every citizen under our form of government to lift his voice and use his influence to combat waste and extravagance and calls for unnecessary services wherever they arise.

In the case of state government citizens must be on guard against unnecessary special appropriations and in the case of local governments, now is the opportune time for expressing to boards of county supervisors, city officials, school trustees and other local government officers their demands for holding expenditures and consequent taxes to a minimum.

We are embarked upon a project which will strain the resources even of our powerful nation. Unless free government and democracy are empty words, Americans, and Californians in particular, must rise to the challenge and be more intelligent, more economical, and more productive than we have ever before found it necessary to be.

Getting Along

Executives given hints as to their ways with people

By VERNE ORR
Vice-president, Chrysler Motors of California

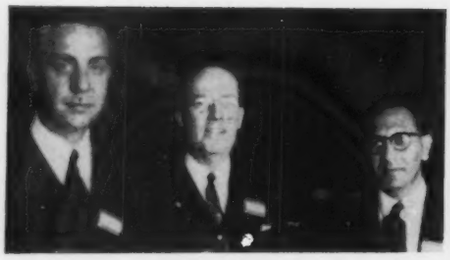
WE HAVE an earnest feeling that sound sales direction is a joint responsibility of the factory and the dealer. We strive constantly to maintain and strengthen the principles involved. There is a continual search for ways and means to make progress for ourselves and our dealers under principles of free speech, free enterprise and free, intelligent competition. It suggests honest, decent and fair dealing in all phases of business conduct. It suggests for us an untiring effort to produce and make available more and better products and conveniences—to constantly make it easier for our customers to buy. The inculcation of this spirit in all sales direction throughout the land plays a vital part in not only helping to preserve but also to further strengthen American business and American institutions.

All of this presupposes certain imperative relationships between people making up a business or industry. For the employee these include the knowledge that to serve well, he must have peace of mind; also that personal progress is his privilege. Two simple admonitions are paramount—be enthusiastic in your work and honor "the Chief."

For the executive a prime policy is to suggest what to *do*—not what *not* to do. A real executive earns because of what he *gets done*, rather than the actual work he does. A man accomplishes things when some appreciation is shown for his work and ideas. Remember that constructive criticism increases a firm's assets—destructive its liabilities. If you are going to criticize a man and you want him to continue to respect you do it quietly; do it confidentially. Take him to lunch—take him out in your automobile—get out where nobody can hear what you have to say. You will build him up in this way and increase the firm's assets; but if you "bawl him out" in public, you will only add to its liabilities. Finally don't forget to delegate authority along with responsibility.

Human relations must be based upon smiles. To insure them, avoid the "I" disease—make yours a "WE" organization. If you want the other fellow interested in you and your success, take an interest in him and his.

Finally, remember that helping another helps oneself.



OPERATING Economics Section Chairman G. E. Bishop, Coast Counties G & E; H. A. Lott, Edison Co., Los Angeles, and Paul Suransky, P G & E, San Francisco. Sales—R. E. Fisher, vice president in charge of them, P G and E, with George Belsey, General Electric Appliance distributor, Los Angeles. H. H. "Kelly" Courtright, president, Valley Electrical Supply Co., Fresno, and H. L. Farrar, president, Coast Counties G & E. and Dean T. Smith, Southern California Telephone Co.

Price of Freedom

Luncheon speaker reminds all Americans of their heritage

SOMETIMES the out-of-towner can show us the beauty of our town by speaking his enthusiasm for scenes which have grown familiar and unappreciated. Certainly the fervor for the ideals and accomplishments of American democracy expressed by Dr. Paul Perigord, professor of French civilization, University of California at Los Angeles, at the Friday luncheon, presided over by George C. Tenney, were such as to rekindle the enthusiasm and patriotism of everyone who heard him. He gave fresh meaning to familiar America whose real qualities and opportunities one may have come to take far too much for granted.

Starting by telling a list of severe criticisms made of America by an observer from a totalitarian country, Dr. Perigord, who was born in France, served in its army during the last war and then came to America, became a citizen, gained his degrees and has taught in its colleges, counterbalanced these criticisms with a list of advancements to civilization made in America. Not that America has not made mistakes, admittedly so in the course of turning its wilderness into the country it is today, but that these mistakes were neither its goal or ideal, was the important fact.

Tracing the background for the ideals of America, Dr. Perigord recalled the inheritance from Greece—for its culture of thought and truth seeking—from Rome—for its ideals of law and government—to Judea—for its sensitivity to beauty and the arts. He spoke of what America derived in tradition and ideals from Europe, begging his hearers not to disavow those contributions from their ancestral countries any more than they would denounce their own grandparents. Then he made vivid again the courageous ideals of the American leaders of the revolution, Washington, Jefferson, Hamilton, Lafayette. He reminded of the slogans of the time, and their expression of the aspirations of America—"Life, Liberty and the pursuit of happiness," "Liberty, equality, fraternity," which he declared was given to France by Benjamin Franklin, "With liberty and justice to all," "Land of the free, home of the brave."

The pioneers who had broken the plains, and builded cities and towns and made its industry, too had been moved by ideals, not the least of which was pride in work, the dignity of labor, joy in doing, in accomplishment. No defeatism or pessimism such as that which is being spread in its place today could have accomplished any of it. With eloquence Dr. Perigord compared this idealism of American tradition and democracy with the substitute that is being forced upon the world in centralized governments which draw to themselves all the strength and power and leave the far flung limbs starved of sustenance, paralysed.

Against the ideology of a supreme state, such as the totalitarian national socialism is forcing on the world through military and economic intimidation, he said American democracy needs to sell again to the world the superiority of democracy, but that democracy itself must be improved—but again by democratic procress. It must enlarge its scope to give freedom not only politically, but freedom too from want and poverty and fear. It must be made to work efficiently and speedily to show its equality to or superiority over centralized dictatorship.

The destiny of American civilization, he concluded with a sincerity which moved his audience to a realization of long forgotten ideals of patriotism, can come from a revival, a rekindling of its national ideals, the ideals that it has brought out of the past to make it great, ideals which will be needed more than ever to face the tremendous difficulties of the near future.

"America has never asked for something easy. It never would have been built if it had. It is not afraid because the future promises to be hard. America to keep her heritage of freedom must be ready to sacrifice—to pay as much for freedom as her enemies are willing to pay to enslave us."

Growing Pains

Aircraft production effects told Friday luncheon

UNPRECEDENTED problems thrust upon San Diego by the employment of a force of 36,000 workers in aircraft factories were reviewed at the Friday luncheon, presided over by L. M. Klauber, vice president and general superintendent, San Diego Gas & Electric Co. Speaker was Major Edgar N. Gott, vice president, Consolidated Aircraft Corp., San Diego, who prefaced his talk by saying that although he could not disclose details, he could say without fear of contradiction that America today builds the best bombers, land planes, sea planes, the fastest, to fly the longest, at the highest altitudes of any in the world.

In discussing the problems brought about by large scale manufacture of planes in San Diego, where orders have piled in for more and more production, he said that to build such quantities requires skilled men and such men must first be trained before they can enter the plant. This has required an increase of 15 times in vocational training facilities. To this the government has contributed $300,000. Housing, the next problem, is being met by

a $9,000,000 government housing project to build 3,000 homes

The city's water distributing system is proving inadequate and along with $1,300,000 spent on this, another $3,000,000 has been appropriated to increase dam facilities. Before long the water supply must be made secure against shortage by a government appropriation of seven or eight million dollars to bring Colorado river water to San Diego over the Coast range.

Sewage disposal, another problem, will require an expenditure of close to three and a half millions, with a like sum for flood control on the San Diego river and drainage. New traffic signals, new highways, and doubling of the San Diego police force were other problems to be met. He commended the community on its cooperation in meeting these problems, made difficult in many instances because government property in the city has removed from taxation about half of its taxable assessed wealth.

Major Gott paid a fine tribute to private utilities and the San Diego Gas & Electric Co. in particular when he said the one thing they had no need to worry about was an adequate power supply to meet the tremendous and unprecedented demands of this vital aircraft industry.

"When this emergency is over," he concluded, "we can return to the urgent need of planes for transportation. We can turn out planes in amazing quantities, but let us use them wisely, unhampered by seditious isms so that the satanic forces of tyranny may be erased from God's green footstool."

The Conclave — Section Meetings in Brief

Operating

From sabatoge to older problems, all discussed

SPREADING over a gamut of subjects ranging from overhead distribution in small towns to a realistic presentation of the possibilities of espionage or sabotage, the Operating Economics Section program covered five different parallel group sessions Thursday. Voltage tolerances for different classes of customers, overhead secondary networks, steam plant operation, hydro plant maintenance, safety, meter corrosion and meter obsolescence were topics put forward for discussion by the section guidance committee under the chairmanship of G. E. Bishop, Coast Counties Gas & Electric Co.

Cleverly emphasizing his points both by indirection and inference, Harold Nathan, FBI special agent, warned the one general session of the section against both a skeptical and sophisticated attitude toward possible sabotage and espionage and a hysterical attitude. His plea was for a realistic conception of the possibilities and the increasing reasons for sabotage. He pointed out that the FBI is powerless to take any part in employer-employee relationships, thus leaving the problem of careful investigation and selection of employees of such vital industries as public utilities solely up to the employer.

New materials available as well as economics of underground distribution in small communities were brought out in a panel discussion arranged by Paul Suransky, Pacific Gas and Electric Co. Because public relations and other factors are forcing more and more underground installations in small towns, distribution engineers have been confronted with the necessity for working out a satisfactory compromise between economics and service requirements with the result that new materials and new techniques have developed.

Experience with a 12-year old installation at Oroville, Calif., was described by C. P. Taylor, PG and E, who asserted that during this time not a single failure of primary or secondary mains had occurred and only four cases of failure have been noted in service runs to sidewalk condulet boxes. This installation employed conventional techniques of the period—fiber duct and wrought iron pipe for duct lines and lead-covered cable for conductors. One disadvantage to the operating organization of a rural type district he cited was the need for a cable splicer in cases of trouble or when changes or extensions were required.

Advantages of a new underground installation at Santa Rosa employing rubber-insulated, non-leaded cables placed in soapstone duct or wrought iron pipe were brought out by W. P. Bedgood, PG and E. Contending that such an installation equipped with oil break disconnects, dry type primary cutouts with "multi-taps" and fuse splices in secondaries should give long and trouble free service, Bedgood outlined these advantages: (1) extreme simplicity; (2) flexibility; (3) no potheads with attendant opportunity for trouble; (4) no special help required for maintenance or extension and (5) ability to make quick repairs in case of faults.

Urging that the distribution engineer in his search for reduced costs should not jeopardize the permanency and reliability of a system by any compromise with inherent quality of materials used, E. L. Brentnall, Okonite Co., reviewed the advantages and disadvantages of both leaded and non-metallic cables. Henry H. Buell, PG and E, discussed underground primary switching equipment, underground primary fusing equipment, secondary connection equipment, including secondary fuses, and leaded and non-leaded transformer and cutout connections as applied to this type of construction. He cited cases of satisfactory operation when such systems were submerged in water for considerable periods.

Transmission, distribution and substation engineers also exchanged experiences on voltage tolerances as applied to satisfactory performance of customer's equipment in a discussion arranged by H. A. Lott, Southern California Edison Co. Basis for the discussion was a summation prepared by A. A. Kroneberg, Edison Co., in which equipment operation was outlined and voltage standards defined. For light he set limits of normal to 97.5% of nor- and 95% as good service. He suggested that where heating and cooking equipment was installed the limits recommended for the grades of service for lighting be raised one volt for the first 10% of saturation of this type of equipment and two volts for 20 per cent saturation and over. For example, he stated that if first class service for lighting called for a voltage range of 117-120, then the same class of service for a group of customers with 10% using heating and cooking appliances, the range would be 118-121 volts and 119-122 volts for a 20% saturation. Induction motors with wound rotors require the same quality of service as lighting. For ordinary squirrel cage induction motors the range can be doubled, with 96.3% to 101.3% of normal rated as first class service and 91.5% to 105.5% as good service. Current rectification equipment requires close tolerances, particularly where the d-c voltage limits are close and mercury arc or vacuum tube rectifiers are employed. Broadcasting stations require close limits and justify individual study and the applica-

tion of corrective measures. Electrochemical processes and other unusual applications cannot be included in a general study but must be treated individually.

In the acompanying discussion it was brought out that in the San Diego area lighting is the determining factor on regulating feeders. The frequency of complaints largely determined whether or not regulation was considered satisfactory. Periodic spot checks are made and a standard of 124 volts at load center has been set. In Pacific Gas and Electric territory 120 volts is considered normal and 124-116 volts as the maximum range. Check of complaints showed that 30% of the customers complaining cited high voltage the trouble and 70% low voltage. Coast Counties Gas and Electric Co. finds that most of its complaints are about flicker. It was emphasized that very few customers are able to determine whether voltage is high or low. A general recommendation was that annual checks be made of current and voltage on feeders during peak conditions. Unanswered was the question as to whether regulated voltage should be maintained at the meter or at the load center.

In a review of overhead secondary network practice F. B. Doolittle, Southern California Edison Co., brought out the economics of this system of operation, described the type of protection now in vogue and sketched the operating advantages and disadvantages. He contended that secondary banking of transformers brings about a considerable reduction in light flicker due to motor starting, that it permits more economical transformer loading and that it provides better service continuity. Methods of obtaining these advantages without fear of cascading are available by using either sectionalized banking or the grid system in which secondaries are interconnected at every feasible point. Discussion brought out that there had been very little banking of secondaries in the region served by the companies represented—one principal reason being the question of safety.

Metering discussions, presided over by W. H. Talbott, San Diego Gas and Electric Co., brought forth some new problems in addition to the perennial questions such as obsolescence. One of these was corrosion of meters and metering equipment with particular reference to the inability of manufacturers to secure aluminum. Possible use of substitute materials was discussed. Considerable progress was reported in clearing up meter obsolescence. Also it was reported that the investigation of the California Railroad Commission on meter test periods and procedure was virtually complete and that regulations on this subject will be issued within the year.

Some metering difficulties have developed in connection with national defense housing and G.H.P. Dellman, San Diego Gas and Electric Co., told how these had been worked out in his area. All houses have been individually metered with the exception of government-built trailer camps and housing units built for single men. These latter may be changed from single meter to individual meters should the structures be converted for family occupancy.

Developments in aircraft instruments since the first World War were described by Lloyd Lee of the Consolidated Aircraft Co. He stated that planes of 1916 were equipped with two crude instruments, while a modern military aircraft has 86 different delicate and accurate meters designed to give the pilot and navigator every conceivable assistance. In most instances dual instrumentation is employed in case of failure of one set. Reason for these elaborate precautions, he declared, was to safeguard the investment in plane and the knowledge, ability and experience of the pilot himself because of the time and money required to train men properly.

Methods of fusing and testing of instrument transformers were shown in a film presented by E. B. Kipp, Westinghouse Electric & Manufacturing Co. A second film showing methods devised and applied for the cathodic protection of electric cables, gas and water mains was presented by Chris Goldkamp, San Diego Gas and Electric Co., who had worked out the technique employed.

Safety discussions dealt principally with pole-top resuscitation. Howard Miller, Southern California Edison Co., reporting to the general session, stated that safety men were agreed that pole-top resuscitation should be applied immediately in the case of accidents while working on lines and that it be continued for a minimum of five minutes before the victim of the accident is lowered to the ground. He reported that all companies in this area are now teaching this technique to their line crews. He also stated that there was a divergence of opinion among his group on the grounding of lines during maintenance operations and also on the question of working on bond wires.

Round table discussions of hydro and steam generation brought out the need for programmed inspection of high tension oil circuit breakers so as to insure proper maintenance. Problems relating to the burning of natural gas in steam plants and of satisfactorily testing fuel oil were reviewed. Difficulties in obtaining satisfactory water wheel buckets for hydro machines was reported.

Administrative

Dealing with public is studied in various groups

FOR the improvement of those functions of business in the electrical industry which may be termed services to administration—accounting, credits and collections, purchasing and stores and transportation, the groups responsible for such services met first in separate committees and then jointing on Thursday afternoon under Vice-chairman S.

ENGINEERS—participants in the Operating Economics Section committee meetings were: Top, Al Strong, superintendent, Coast Counties G & E, and W. H. Talbott, meter superintendent, San Diego G & E. Center, F. H. Searight, Allis-Chalmers, San Francisco, George H. Hagar, and P. M. Downing, general manager, P G and E. Bottom, C. R. Benson, General Electric, and Earl Crellin, P G and E, of San Francisco

TOPS—in their respective jobs; W. F. Raber, president San Diego G & E in the top picture, with Harry J. Bauer, president Edison Co. and P. M. Downing, vice president and general manager, P G and E. Next picture from top is of Director M. H. Jankelson, Incandescent Supply Co., San Francisco; Managing Director Vic Hartley, and A. E. Hitchner, Westinghouse, Los Angeles, and PCEA past president. Team mates with big convention jobs, Howard W. Hayes, publicity chairman, and Joe A. Long, convention chairman, both from Edison Co. At bottom are Ray Gheen, Ohio Brass Co., who had charge of the manufacturers' and wholesalers' cocktail party, with Bill de Waard, San Diego G & E, Purchasing and Stores

W. Murray, Westinghouse Supply Co., Los Angeles. And since all such services come into public contact, the program of discussion dealt first with the use of tact and finesse in dealing with customers. Discussion leader for this was Mel Smith, Southern California Telephone Co.

To this lively subject was added an equally valuable talk by C. E. De Rochie, trust officer, Bank of America, San Diego, on the art of writing letters without offending and still getting results. This ticklish phase of public relations calls for naturalness, sincerity and brevity, but more than all, of the knack of turning the viewpoint around to see and tell what needs to be said from the customer's own point of view. A paper on the requirements for endorsements, for stop payments on checks, by P. C. Hale, cut short for lack of time, evoked such interest that it will be carried over until the next conclave.

Individual committee group accomplishments may be summarized briefly in the following:

Accounting Group

F. C. McLaughlin, Edison Co., sponsor. Albert Cage, vice-president, Nevada-California Electric Corp., was honorary chairman. Conducted as a round table discussion by the 28 accountants present, participation in the affair was spontaneous and spirited. Subjects covered followed the agenda closely and included: Accounting problems relating to meter and transformer control; Segregating of revenues by rate schedules; Short cuts to accounting economies, recording pole line data for future reference; Sectionalizing operating expense controls; Accounting for spare parts and miscellaneous materials in power plants and substations; Accounts payable — simplified invoices, dealers' monthly statements; California use and sales taxes—payments to dealers, particularly in connection with sales tax ruling No. 14, and assessments on sales, especially so-called "occasional sales".

Purchasing and Stores Group

Wm. de Waard, San Diego Gas & Electric, sponsor—With few reservations final discussion and approval was had on the recommendations of the committee on standard packages of pole line hardware. The newly approved list is to be forwarded to all members of the group.

P. W. Price, general manager, Victor Insulators, Inc., under the title, "The Cornerstone," related some of the difficulties to be expected in obtaining high voltage insulators, particularly because shortages or diversions for national defense are being experienced for such materials as cadmium, formaldehyde, zinc and imported clays as well as a shortage of skilled ceramists. He urged purchasing agents to place orders for insulator requirements far enough ahead so that production and delivery obstacles will not hamper meeting delivery schedules themselves. He also requested both purchasing agents and engineers to reduce the number of specialty items and confine requirements as much as possible to standard catalog items under standard and accepted AIEE specifications. He also illustrated with slides the machinery and methods used in insulator manufacture.

Lt. Comdr. C. E. Swithenbank, U. S. Navy purchasing officer, 11th Naval district, spoke on priorities. He was questioned eagerly by the group for interpretation of many details. There followed an extended discussion of items on the "critical list" and methods of obtaining priorities by utilities for projects directly involved in national defense, and maintenance essential thereto. If a utility requires such material quickly, he clarified, it is not necessary to take the matter up with OPM in Washington, but to obtain authority from the nearest military defense headquarters. Caution was urged upon utility men to avoid the use of priorities wherever possible.

Credits and Collections Group

Charles Davies, San Diego G & E, and L. C. Rausch, Coast Counties G & E, co-sponsors. Where to get good collectors, was the first topic presented by E. J. Wright, San Diego G & E. In his paper he evaluated all the possible sources for recruiting good collectors—from within or without the company, their good points and bad, and left the matter for each one to decide for himself. In doing so he told what is expected of a trained collector for a utility.

The relative merits of the neighborhood collection agency — such as a branch bank, grocery or other store, as against the company district office was discussed by Fred Wright. Consensus seemed to be in favor of the company owned branch for many reasons.

A paper prepared by E. T. Crick, of Coast Counties G & E was read by Rausch. Dealing with delinquent accounts, it contended, must be handled with judgment and classification of the kind of delinquent the customer proves to be. Constant review of the paying record was also recommended to keep the classification correct. Low percentage of write-offs from delinquent accounts with such a policy was reported.

Transportation Group

P. H. Ducker, Edison Co., discussion leader. Motor vehicle maintenance problems were thoroughly explored at a well attended meeting of the transportation group. Legislation, new designs in transportation equipment and personnel handling were among the phases discussed.

Recent passage of AB-1268 by the California legislature will bring new weight formulas in respect to concentration of loads on trucks and trailers. The regulations are based on bridge capacities rather than highway loading. Gross allowances will be increased somewhat as a result of these new laws.

An exchange of ideas and methods of the various companies in respect to equipment design proved of keen interest. Revolving ladders, similar to fire equipment, for the use of lamp maintenance crews or tree trimming brought a corollary discussion on the advisability of hiring tree experts for trimming as against training company crews. The new snow machine developed by Edison Co. for use in high altitudes in hauling supplies over the mountains in winter evoked much interest. Two-way FM radio equipped trouble cars were discussed by representatives of several companies.

A standard truck design developed by San Diego G & E was explained by C. D. Weiss of that company. It can be built up into various types of transportation units.

Improved efficiency and savings in valuable time were described by Ducker of Edison as resulting from the sending of the line truck out ahead with equipment and following up with a station wagon for the crew. Groundmen too can be transported ahead when necessary to prepare for the linemen who can be brought up later.

A prepared paper on lease of cars was not read.

Business

Sales groups face tomorrows uncertainties realistically

SELECTION was necessary in singling out from the multitude of business ramifications of the electrical industry those subjects and problems upon which committee thought and cooperative work could bring results where they will do the industry immediate good. In the beginning of the association year the Business Development Section thus selected wiring, lighting, highway lighting, ranges and water heaters, small appliances, farm electrification and industrial power for group study. The convention culminated the year's activity of these groups.

Under Chairman R. C. McFadden, Edison Co., the following committees and groups accomplished much, as reported at the convention.

Electric Range and Water Heater Group

A. W. Althouse, Edison Co., chairman.

Success of all-industry sales campaigns was indicated by the first two speakers, who outlined such selling programs held in northern and southern California. W. I. Powell, merchandise sales manager of Westinghouse Supply, San Francisco, reported that 3,000 ranges and 1,200 water heaters were sold in the 60-day northern campaign in PG and E territory. He attributed its success to enthusiastic industry cooperation, excellent dealer meetings, and an advertising program which enabled the dealer to buy $100 worth of advertising for approximately $17, with PG and E paying 1/3 and the manufacturer 50%.

E. M. Frellson, district appliance sales manager, G-E, Los Angeles, reviewed the southern California electric range Popularity Sale whose success has its backers already working on a similar campaign for next fall. The eight-piece aluminum set premium provided an excellent reason for customers to buy now, and quoting range prices installed eliminated an obstacle. Frellson outlined the dealer meetings and dealer helps used in the project, and showed advertising pieces which assisted greatly in making the sale a success. This campaign was held in the service territory of the Edison Co., and in Los Angeles, Glendale, Burbank and Pasadena.

F. T. Frohnapfel, advertising and sales promotion manager, Kelvinator division of Nash-Kelvinator Sales Corp., Los Angeles, listed the following points as special inducements for range sales: (1) Continuous advertising (2) Department store cooperation, both for added sales and prestige (3) Uniform wiring policy under which ranges can be quoted installed (4) Liberal trade-in allowance (5) A duration of at least 60 days on special sales campaigns (6) A liberal remuneration plan for dealers' salesmen.

"We must see to it that the thousands of West Coast appliance dealers can sell electric ranges at a profit or they will shift their activity to lines which pay better," said W. A. Marsden of Los Angeles, vice-president, George Belsey Co., in a talk on the position of the dealer in range sales. Other members of the range industry should cooperate extensively with the dealer in selling aids, advertising, finance terms and home economist assistance, he said. The most successful type of dealer-utility company relations is that of fair cooperation, as compared to complete utility operation without help to dealers, or complete dealer operation with utility help, he said.

A. C. Miller, PG and E appliance sales manager, San Francisco, discussed industry cooperation in range promotion. He emphasized the fact that industry harmony must precede a sales campaign, and stated that plenty of time is a necessity in planning an all-industry sale. The cooperative plan must be so satisfactory that everyone will enter into it and no small organizations will choose to work on their own at cut prices. A "blow-off meeting" held after Northern California's campaign had closed proved very satisfactory in maintaining everyone's satisfaction, he stated.

How to retain a range customer when the time comes for her to buy a new range was the subject of a talk by W. E. Cranston, vice-president and general manager, Thermador, Los Angeles. The replacement market belongs mainly to the utility because of the old range trade-in, Cranston stated. Selling a new range to a present customer is different in that she was once sold on the advantages of electric cookery and probably is yet, he said. And a new range offers her many improvements she did not have in her old range. The wiring problem does not exist in this type of sale. However, electric ranges in both replacement and new fields are battling highly subsidized competition and there is plenty of work ahead, he concluded.

In a few pertinent spontaneous remarks, H. H. Courtright, president, Valley Electrical Supply Co., Fresno, and a PCEA director, told of an effective sales plan under which a salesman immediately follows up a seal-off order to inquire if the range is being taken away or left there, and if a sale may be in prospect. He also suggested closer cooperation of manufacturers with home service girls who introduce the ranges to their new users.

A brief open discussion on water heaters concluded the meeting.

Appliance Forum

J. Clark Chamberlain, manager, Bureau of Radio and Electric Appliances of San Diego County, chairman.

Approximately 150 dealers and their salesmen, wearing special badges and present in response to personal invitations, joined convention delegates in this session. It was the first time that local dealers in such numbers had been invited to a PCEA convention and responded so enthusiastically.

Air sterilization and electrostatic air cleaning, two new shapes on the electrical horizon, were discussed in an interesting illustrated lecture given by Alan J. Bronold, Westinghouse man

DEVELOPERS of business—Among the lighting group were Frank Hansen, director of Western Institute of Light & Vision; Walter Carlson, General Electric Lamp Dept., Oakland; Fred Wellhouse, Westinghouse, San Francisco, and John Walsh, PG and E, San Francisco. Center, Alan J. Bronold, Westinghouse manager, Los Angeles, explains the Precipitron air cleaner. At right, range and water heater discussion A. W. Althouse, Alhambra division manager leader at extreme right, and H. V. Busby, Pomona division manager, both from Edison Co.

ager, Los Angeles. These will provide selling opportunities when the saturation point is reached on refrigerators, radios and other appliances of general acceptance, he predicted.

A large cabinet working model was used to illustrate the precipitron electrostatic air cleaner.

Since the air of several large buildings has been cleaned in this manner for about five years, this method is not new, Bronold explained. However, its introduction to the domestic field will be an innovation. Equipment is now in trial use in about 1,000 homes throughout the United States, so that when the Precipitron is placed on the market it will have a history of rigid tests. Many persons suffering from asthma and hayfever caused by pollen in the air have found relief in electrostatically cleaned air.

Since the atmosphere and everything we touch is germ laden, a great need exists for air sterilization, Bronold declared. Two developments have been made in this regard: the use of superheated steam and the bactericidal lamp, or Sterilamp as it is called. The latter is the most popular and is of two types: the hot cathode lamp which emits heat, uses low voltage and high current; and the cold cathode lamp, which is cold in operation, uses high voltage and low current.

A $20,000,000 business in the next ten years on air cleaning and air sterilization was forecast by Bronold, who illustrated his talk with slides and a humorous moving picture on air sterilization, "The Bugaboo of Bugville."

Adjustment of credit terms to the present condition of business was urged by H. Garfinkel, western district manager, G-E Contracts Corp., San Francisco, who spoke on "The Appliance Financing Outlook." Industrial production is at an all-time high and the national income is rising to a point where retail sales this year are expected to reach from 16 to 17 million dollars this year, he stated. This boom period is certain to be followed by a readjustment period, and business must look ahead to the future when establishing today's credit policies.

Conservatism was advised as the heart of present credit attitude. Collections and credits should be maintained closely and merchandising should be done carefully.

"Installment selling may be due for a fall unless steps are taken to strengthen the credit structure," Mr. Garfinkel stated.

One of the coast's most popular inspirational sales speakers, Victor M. Ekdahl, Pacific coast manager of Swift and Co. Refineries, entertained and informed the audience with a swift moving talk punctuated with memorable epigrams. In running a business you should organize, deputize, supervise and analyze, Ekdahl stated. "The best way to wait on a customer is not to make him wait. Pleasurable work makes for enthusiasm, and enthusiasm makes for sales. Do what you do well, for someone is bound to be looking. Smile—and learn about the other fellow. Be human, kind, courteous and optimistic. It is better to sell one customer five times than five customers once. Enthusiasm is the outside evidence of inside belief. Don't fear the future, for if you do you will fumble the present. National defense is important, but personal defenses are important, too. In building up personal defenses, you should keep four things: Your faith, temper, sense of humor and friends.

Executive manager of the Chamber of Commerce in one of this country's fastest growing cities, Major T. C. Macaulay of San Diego presented a review of defense spending. Economic effects being wrought by the tremendous amounts of money being expended in national defense, he said, in San Diego has caused expansion of industries, erection of the largest housing project in the United States, and many other similar results. The emphasis in national defense was shifted to aircraft, he stated, when the Panama maneuvers of the United States Navy showed that the Panama Canal could be attacked successfully against the defenses of our air force as it was at that time. Since that time, we have been building airplanes in such numbers that we are prepared to meet any enemy with an air force second to none.

Industrial Power & Heating Committee

G. N. Hawley, Edison Co., chairman—Separate committee reports from the subcommittees of the group were discussed in rotation. First came that on industrial data sheets, chairman of which was J. A. Corlett, General Electric Co., Los Angeles. Two data sheets were prepared during the year and published in ELECTRICAL WEST. Canvass of member companies indicated that the sheets were of value to power and heating salesmen but members were reluctant to take time to prepare data for compilation by the chairman. Communication with Berkeley Snow, manager of the Northwest Electric Light & Power Assn., had brought details as to how that organization carried on similar activity.

Main reason ascribed to its success was a prize system for best data sheets turned in each year. Corlett suggested that similar inducement be offered.

A. L. Laws, chairman of the Industrial Power & Heating Handbook committee, suggested combining his committee's and the data committee's work, data sheets after publication to be re-

printed and included in the handbook.

Recommendations included the continuation of the activity during the 1941-42 association year, the offering of a bonus for each data sheet accepted for publication, publishing such sheets in ELECTRICAL WEST and combining them with the handbook committee to supply reprints to all handbook holders.

A subcommittee on competitive power, with J. P. McElroy, San Joaquin Power division, PG and E, recommended that the studies of competition for the past two years be combined. It was found that agricultural power revenue lost to natural gas engines occupied first place up to 1938, but during 1939 and 1940 natural gas engines slipped to second place and diesel or oil engines led others. This was expected to continue. Steam engines or turbines took no power away for the first time in six years.

Total losses were less in 1940 than in 1939 and 43% less than in 1936, the biggest year competition had.

As soon as the emergency is over, power men all felt, utilities can expect unparalleled competition. Present plant expansion to produce internal combustion engines and steam turbines to satisfy defense requirements will then be turned to making quantities of competitive devices on a scale and at prices unheard of before. Capital costs of such devices have kept the balance in favor of purchased electric power. But with low fixed charges the economics may be reversed unless power rates are reduced greatly.

Another subcommittee on welder ratings was headed by H. G. Dillin, San Diego G & E. Its job was to finish a study started last year. A joint committee of AIEE and the resistance welder manufacturers association studied the same problem. The AIEE committee has completed standards and recommends that utilities adopt these standards. In view of this action the committee asked to be discharged.

Wiring Group

G. E. Zelhart, chairman Red Seal Committee, PG and E, Fresno; J. H. Pengilly, chairman Standardized Services Committee, Square D. Co., Los Angeles; E. F. Watkins, vice chairman Code and Ordinance Committee, Edison Co., Los Angeles.

The three committees interested in the interrelated problems of wiring met together at the conclave sessions. Although attendance was limited, many important wiring matters were decided. First were consideration of changes to the Red Seal specifications, particularly as to defining terms and to be consistent with trends. Omission of center fixtures in many bedrooms brought a recommendation that a rule similar to the living room requirement, or at least one outlet switched from a location near the door, be provided in lieu of a ceiling outlet. Similarly provision for one light in a garage on the same circuit as a convenience outlet was recommended.

Just off the press, a new four-page pamphlet, attractively printed in color, was shown by J. H. Pengilly, reporting for the standardized services committee. It combines the Red Seal Adequate Wiring story used in previous folders with a recommendation that the standardized service be included. Five standardized service specification sheets for five different sizes of houses are to be made available to architects and home builders in connection with the Red Seal literature in southern California. Northern California members expressed a hope to have a similar publication for that area.

Elation is the only word to describe the close harmony of the three Wiring group chairmen—Joe Pengilly of the standardized services committee, George Zelhart the Red Seal committee, and Frank Watkins, code and ordinance committee.

General discussion brought forth many ideas for promotion of adequate wiring. Arthur Kempston, PCEA field representative, reported that bankers in southern California are now recognizing extra value in a Red Seal wired home and are to make recommendations through the clearing house association to permit member banks to make larger loans on homes that are to be Red Seal wired.

Newspaper and billboard campaign on Red Seal carried on by PG and E was described by Walter C. Heston, Northern California Electrical Bureau, who also presented a chart showing the elements and factors needed in selling the adequacy idea to the purchasers of new homes. H. C. Rice, merchandise manager, Edison Co., suggested a contest with prizes among school children for a better slogan for adequate wiring, something that will click as has "Better Light—Better Sight." D. E. Harris, director of PCEA, who was honorary chairman, said the matter would be taken up immediately.

New uniform ordinance, over which the committees had wrestled so hopelessly in previous conclaves, was finally presented as accepted and approved by all concerned. It is now to be given wide circulation and several cities have been awaiting its publication for adoption.

Lighting Group

John Walsh, PG and E, San Francisco, chairman—Ever bringing forth new lamps, light sources and improvements on the old, the lighting industry has several new ones again, according to W. H. Robinson, Jr. General Electric Lamp Dept., Los Angeles. Among newest mentioned were several new fluorescent sizes, one a 15 in., 14 watt, which used in pairs in series, requires only a small incandescent lamp as auxiliary. New 3-kw. high intensity rectified fluorescent for industrial use, high mounting, was promised soon.

That fluorescent lamps, their auxiliaries and starters have certain critical voltages at which they will not operate was the useful information E. J. Willitts, electrical superintendent, Tidewater Associated Oil Co., San Francisco, disclosed. Analysis of fluorescent troubles from that beginning yields quickest results, his extensive experience with such lamps in all temperatures and conditions led him to believe.

Bert Deleray read for Cliff Walk, Westinghouse Lamp Co., San Francisco, a strong recommendation for a certification plan for residential luminaires, and since the Artistic Lighting Equipment Assn. has made a beginning with IES standards, he urged these standards be started. Morris Hixson, G-E Lamp Dept. manager, Oakland, read a paper by Striker, telling the reasons behind the Fleur-O-Lier specifications for commercial fluorescent fixtures.

A quick review of facts regarding the lighting installations in aircraft and other defense industries in southern California, given by George Rankin, Edison Co., left the group gasping at the volume of lamps and fixtures and happy at the high levels of illumination generally required. (See page 63.)

Public acceptance of higher levels of illumination is now assured by the levels demanded by the defense industries, said Frank Hansen, Western Institute of Light & Vision. He urged, however, that lighting men, who have the leadership responsibility because they teach those who retail lighting to the public, solve the seeing problem honestly so that they will never be ashamed to look anyone in the face. Solving lighting problems really means solving seeing problems and must be approached honestly from that aspect

not from the standpoint of mere wattage or methods or equipment.

A technical subcommittee on highway lighting met with G. H. P. Dellmann, San Diego G & E as chairman, A. E. Wishon as honorary chairman, and decided to hold three or four technical meetings on highway lighting problems with state highway engineers.

Rural Electrification Group

Thor W. Christensen, PG and E, Santa Rosa, chairman—Papers deserving of far more attendance on subjects of genuine importance were presented to a small but select rural electrification committee. Thor Christensen stressed the need to analyze total crop costs as compared to power costs to determine just where an unbalance might make the crop unprofitable, rather than electricity itself. In many cases poor equipment or unwise operation may throw the proportion off and cause loss rather than profit to a farmer. Cost accounting, the group felt, might be made a CREA project.

Harry V. Patton, sales manager, PG and E, San Rafael, discussed a program for coordination of sales promotion to rural electrification. Together with advertising and sales effort must go real analysis of the customers themselves, classifying them and directing effort where it will do the most good, bringing into the program dealers too.

Ben D. Moses, University of California, Davis, reviewed the progress of the Committee on the Relation of Electricity to Agriculture since its inception, May 13, 1924. After telling of past projects he left for consideration a list of possible future investigations into such fields as the effect of electromagnetic fields, x-rays, various wavelengths of energy on plant growth, animals, bacteria, molds.

Revisions proposed for the Rural Electrification Handbook were also discussed. Electric fence precautions, yard lighting information, farm motor uses and selection were among those recommended. A report on these is to be made at the fall conclave.

THOR W. Christensen and his Rural Electrification Group, .Circus room.

Competitive factors affecting rural electrification were discussed by Lyle W. Smith, Edison Co., Visalia. He talked of equipment vs. competitive equipment, poor equipment, new cheap competitive fuels, total electric vs. fuel costs, improper applications of electricity, lack of a united front by the electrical industry and the constant need for better qualified sales representatives. "A good rural electrification man's work is never complete," he concluded.

Annual Meeting

Officers for next year selected, reports omitted

WITH brevity unmatched in any previous convention the annual meeting was dispatched and the election of officers expedited. A telegram from Treasurer N. R. Sutherland, PG and E, assuring the president that the association was solvent, was accepted in lieu of a lengthy and detailed report, which will be examined more minutely by the board of directors.

Managing Director Victor W. Hartley had prepared a report too, which although not read, deserves mention in many particulars because of its reflection of the growth and activities of the association. In it he highlighted such figures as membership—now totaling 2,783, of which 121 are company members representing all branches of the industry, 2,641 employee members of company members, and 31 associates such as inspectors, consulting engineers, etc.

The two fall conclaves in Pasadena, attended by 609, and at Oakland, attendance 358, represented the largest in association history. District meetings, 14 in all, plus one in Nevada, with a total attendance of 2,760, a 19½% increase over previous years, were attended by contractors and dealers to almost 50% of the total. Program for a similar series is being developed now, he said, for the fall.

An innovation this year was letters to members inviting suggestions for subjects upon which they would like more information and several of the convention conclave subjects resulted from these letters. He spoke of the Richard E. Smith Memorial Award, the contest on adequate wiring.

During the year the association had published as a result of committee activity several works—a reference manual on petroleum industry electrification, industry data sheets for the industrial heating and power committee, a Women's Committee report, the standardized services committees layouts for home service requirements, the new uniform electrical ordinance. Mention also was made of the excellent meeting which the technical subcommittee of the highway lighting committee had had with the state highway engineers, the work of the industry information committee in programing the district meetings, the Red Seal certification of 2,368 homes, the fact that PCEB became certification agency for the National Adequate Wiring Bureau in Los Angeles, Pasadena, Burbank and Glendale.

GEORGE C. TENNEY, was elected PCEA president for the 1941-42 year at the close of the convention. He is editor of Electrical West and has been a director for many years.

New officers for the 1941-42 year include George C. Tenney, editor, ELECTRICAL WEST, president, and the following two-year term directors: I. W. Borda, Okonite Co., San Francisco; J. H. Pengilly, vice-president, Square D Co., Los Angeles; S. E. Gates, General Electric Co., Los Angeles; K. M. Ryals, Stone Ryals Electric & Manufacturing Co., San Francisco; N. R. Sutherland, Pacific Gas and Electric Co., San Francisco; Albert Cage, vice-president, Nevada California Electric Corp., Riverside; D. E. Harris, vice-president, General Electric Supply Corp., San Francisco; W. C. Mullendore, executive vice-president, Southern California Edison Co., Los Angeles; and Milton Sanders, Central Arizona Light & Power Co., Phoenix.

Retiring president C. E. Houston was presented with a plaque of appreciation for his services to the organization.

Entertainment

Entertainment at the convention climaxed at the banquet, Friday night, at which an exceptional floor show was staged under the master of ceremonyship of W. H. Robinson, Jr., chairman of the banquet committee. Followed by dancing in the colorful circus room,

this speechless banquet proved an excellent let-down from the intense concentration of the sessions. Other department features had been arranged for by G. H. P. Dellmann, program manager. Wednesday evening moving pictures, Thursday evening a special picture, "Modern Plastics, 1940," were shown.

Before the banquet the manufacturer and wholesaler members of the association gave a cocktail party to all in the main dining room. Ray F. Gheen, Ohio Brass Co., was chairman of this committee.

"Convention widows" were entertained by an enjoyable social program arranged by a committee headed by Lane D. Webber and including A. E. Holloway and Joseph H. Pengilly A get-acquainted informal tea was held Wednesday afternoon, and on Thursday morning a special chartered boat took the ladies for a delightful sightseeing trip around San Diego bay.

Highlight of Friday's events was a talk given by Mrs. Belle J. Benchley, curator of the famous San Diego Zoo. Mrs. Benchley is the only woman in such a position in the world.

GOLF

In the golf tournament, always the high point in recreation for many conventioners, the association's trick handicapping system added a spice of uncertainty to what might otherwise have been mere mathematics. Selecting a few unnamed holes from the total upon which to base the handicap average left everyone in a highly speculative position.

Winners of the three traditional cups were: W. E. Cranston, Jr., the H. M. Byllesby cup for low net among members with handicap of 18 and lower. The Pelton cup was won by M. C. Hixson. It is for members with 19 handicap and higher. A. E. Holloway won the Addison B. Day cup for low net for utility employees only.

In the first flight, low gross was taken by F. C. McLaughlin, Edison Co.; low net by W. E. Cranston, Jr., Thermador. In the second flight, low gross was won by A. E. Holloway, San Diego G & E.; low net by M. C. Hixson, General Electric Lamp Dept., Oakland.

Blind bogey winners were: J. L. Cook, Joslyn Co. of Calif., Los Angeles; K. M. Ryals, Stone-Ryals Electric Mfg. Co., San Francisco; B. D. Haugh, Edison Co.; Pete Affolter, Garland-Affolter Co., San Francisco; H. F. Hartzell, Maydwell & Hartzell, San Francisco; W. H. Talbott, San Diego G & E.; Howard Miller, Edison Co.; W. G. Tapping, Cutler-Hammer Inc., Los Angeles; and C. A. Purviance, The Okonite Co., Los Angeles.

TAKE IT EASY—that's what Fred Fenton, western manager, Easy Washing Machine Co., San Francisco did between convention sessions at Coronado.

Other Associations

Miscellany of new notes of group activities

Comparative wiring costs under the 1937 and 1940 National Electrical Codes were presented to the Puget Sound Chapter, International Assn. of Electrical Inspectors at its last meeting in Seattle by Roger Walker of Puget Sound Power & Light Co. Costs were estimated on 100 amp. ft. type R wire, 1937 Code compared to type R, RP, and RH, 1940 at 60 amp, in 12 lower at 135E78NN 1940 Code. Data revealed type RH to be 12% higher at 60 amp. to 12% lower at 135 amp. From 135 to 600 amp. a gradual increase in cost to 92% was indicated.

At the invitation of Hammond of Longview, President Newton announced that the next meeting in July, would be in the Kelso-Longview area and would include a visit to the Reynolds Aluminum Co. plant. The Portland group will be invited to join with the Puget Sound Chapter.

● PLANS are rapidly being perfected for the Pacific Coast convention of the AIEE to be held at Yellowstone National Park, August 27-29, 1941. Headquarters will be at the Canyon Hotel, which is near the Great Falls of the Yellowstone River. Time and place of the convention have been arranged so that those attending may combine the meeting with a vacation trip.

● RELATIVE MERITS of fluorescent and incandescent lighting for classrooms is treated in the February issue of *California Schools*, the official publication of the California State Department of Education. An article written by Charles Bursch, chief, division of schoolhouse planning, contains the results of an engineering study and analysis made by Robert Dearborn, illuminating engineer of San Francisco, after a detailed analysis of a 30-room traditionally lighted school building as to its visual requirements, illumination and electrical facilities. The particular study made shows a maintenance cost per year difference between fluorescent and incandescent of about $10.00 in favor of fluorescent. The division of schoolhouse planning is careful not to recommend the figures as applying generally to school buildings but recommends school districts proceed with modernization only after a similar detailed study has been made by competent engineers or consultants.

K. W. Browning, general sales department of the Utah Power & Light company, has been placed in charge of Adequate Wiring promotion throughout the utility's entire territory. In each of the company divisions, sales promotion men are being trained by Browning on the importance of proper wiring in new home construction. They will contract architects, building contractors, real estate agencies and all others having to do with home building.

In addition, all new home builders will receive a personal letter with a new promotional folder entitled, "Cheap Electricity—The Key to Better Living in Your New Home."

● TWENTY-FIVE CERTIFICATES of adequate wiring were issued recently to Utah Copper Co. for homes constructed at Copperton, Utah, thus bringing the Electrical League of Utah's total of certificates over the hundred mark. Copperton is a new city being constructed for employees of the Copper Co. being moved out of Bingham to increase facilities at the open pit copper mines there. The new homes are rented on a unique rental plan whereby employees are charged full-time rent only when they complete their full work schedule, paying rent only for the time they do work. Copper has been used extensively to shingle, drain, screen, and adequately wire these homes; several houses are of all-copper construction even to doors and walls.

● SEVENTH ANNUAL WESTERN SAFETY CONFERENCE will be held in Seattle, Sept. 22-28. Industrial and public safety in all phases will be the basic topic of the convention, according to J. W. A. Bollong, conference president.

NW Accountants

Customer accounting, store and property coordination, NW topics

Customer accounting problems, continuous property records and the coordination of stores and property records were the broad topics of a variety of papers and reports presented and discussed at the 16th annual meeting of the Accounting & Business Practice Section, Northwest Electric Light & Power Assn., at Baker, Ore., May 15-16, with Paul R. Enright, Eastern Oregon Light & Power Co. chairman. Other subjects presented included an analysis of the relation of government and business by attorney A. A. Smith, Laing, Gray & Smith, Portland, and some suggestions on the accountant's function in federal and state investigations and hearings by J. E. Anderson, Puget Sound Power & Light Co.

The interests of the people are most efficiently served when government remains an umpire and neither moves into the field of business as a competitor nor attempts to exercise too great a control over it, Mr. Smith asserted.

C. J. Strike, president of Idaho Power Co. and president of the association, scheduled for a part on the program was unable to be present, but sent a message on benefits to the operating utilities and to the public of the "parent company" system of financing and integration. Referring to the public utility act of 1935, he said, "I am not so much concerned with the effects of section 11-B of this act on the 'parent companies' and their large subsidiaries serving industrial areas, where the volume of business is sufficient to attract capital from the investing public, as I am with its effect on the smaller operating companies serving vast areas, where the volume of business is entirely inadequate to attract new capital from the investing public at low rates of interest." After analyzing the function of the parent company, he said, "Solely from an operating company point of view, and based upon 25 years of observation and experience, I am convinced that the operation of section 11-B is not in the public interest."

Customers accounting problems were introduced for discussion by E. H. Halliday, and Gus Anderson, Utah Power & Light Co., under four headings: "Making service bills clearer to the customer," "Refunding Customers' Service Deposits," Disposition of Unclaimed Deposits," and "Methods of Pro-Rating Customers' Bills." H. S. Carringer, Idaho Power Co., explained the system for a centralized control of final bills and balances in his company, and this precipitated a discussion of collection policies, indicating a trend toward a more strict and prompt policy of following up delinquents as a means of keeping old accounts at a minimum, reducing the total value of delinquency, and being fairer to the large percentage of customers who paid their bills promptly.

A method employed in The Montana Power Co. for analyzing customers by volume of use, as a by-product of machine accounting and billing, was explained by Robert O. Kerr of that company. Such analyses, which can be produced as a by-product in remarkably quick time and with little expense, are invaluable for use in rate studies and as a guide to appliance selling and promotion by the sales department. Concentration of sales effort on the low use customers, as tabulated by this method, has resulted in larger proportionate net earnings from new business, since increased kw.-hr. consumption by this group is used on the higher steps of the rate.

E. C. Alford, Portland General Electric Co., explained his company's system of carrying a continuing inventory of physical property by units of properties. A method of short-cutting stores accounting to relieve the foreman on the job of too much detail and still produce an accurate record for charges to capital and for retirement, was explained by V. T. Montgomery, Idaho Power Co. Another short-cut for allocating stores loading charge to the principal account under major account headings rather than to all the sub-divisions in the classification, was proposed by F. C. Hessler, Eastern Oregon Light & Power Co.

L. A. Grettum, vice president of Eastern Oregon Light & Power Co., welcomed the delegates and spoke briefly at the annual dinner. The dinner and other features of the meeting, including a tour of the mining country surrounding Baker, were handled by F. C. Hessler, chairman, V. V. Lyman, L. G. Gray and A. N. Reider, all of Eastern Oregon Light & Power Co. The meeting was attended by 75 delegates representing all the larger companies in the association.

● ANSWERS to a complaint of the Federal Trade Commission charging the Rigid Steel Conduit Assn., National Electrical Wholesalers' Assn., the Organization Service Corp. and the manufacturers of conduit with conspiracy to suppress price competition has been entered by all its parties. In these answers they contend the complaint is without foundation and deny that they have violated the provisions of the Federal Trade Commission Act. The matter will be taken to the courts for settlement.

Award to RMEL

Geo. Lewis accepts ATA "Award of Merit" for group

George E. Lewis, manager of the Rocky Mountain Electrical League, received long-overdue national recognition April 28, when he accepted from Jesse H. Jones, secretary of commerce, the coveted Award of Merit symbolizing outstanding service to the public and to the industry he represents, bestowed annually by the American Trade Association after a nation-wide contest.

The citation went jointly to the League and its chief executive on a basis of the 1940 record when RMEL: Cooperated with federal power enterprises in territory served by the League; advanced public and industrial relationships; promoted significant power sales promotional activities; expanded the League's realm of public usefulness; contributed through organizational functions to national safety standards; participated in civic and state projects designed to benefit the public; established leadership in a distinguished educational program among dealers, contractors and electric utilities.

This is believed to be the first time the electrical industry has been accorded this honor, though Rocky Mountain Electrical *Association*, predecessor of RMEL, was awarded an American Trade Association Certificate of Honor in 1935, in competition with trade, commercial and industrial organizations of the nation whose business-building and public relations achievements were deemed notable. In general, the Award of Merit signifies that Rocky Mountain Electrical League is a "wholesome social and economic force on behalf of the public as well as the electrical industry—as a whole."

Though the League does not serve an important industrial area, it boosted power sales by systematic and continuous promotion of lighting, indoors and out, and domestic consumption, through appliances. Street and highway illumination bulked large, last year, in the long range power-selling program.

G. B. Buck, president of the Rocky Mountain Electrical League, who is vice-president and commercial manager of Public Service Company of Colorado, officially accepted the American Trade Association citation at a special R.M.E.L. meeting May 12 where electrical dealers, contractors, distributors and utility executives were present to render tribute to George Lewis.

A Bit Excessive

Why acceptance of new wire tables is slow

Delay in the wholehearted acceptance of the 1940 edition of the National Electrical Code has been caused by a difficulty to accept as reasonable the new wire carrying capacity tables, in spite of their engineering background. This was illustrated at a recent meeting of the Central California Chapter, International Assn. of Electrical Inspectors, in Fresno, when the subject was discussed. R. V. Jones, service instructor, San Joaquin Power Division, PG and E., reported the following experience:

"The problem was one in which we were attempting to convert two services, one a 3-wire, 1-phase of three 500,000 circ. mil. lead covered conductors and the other a 3-wire, 3-phase installation of three 250,000 circ. mil. conductors, to a 4-wire delta service of sufficient capacity to replace both services. We wished to use the existing ducts, a 3" and a 4" conduit, as they were buried in concrete for a considerable distance.

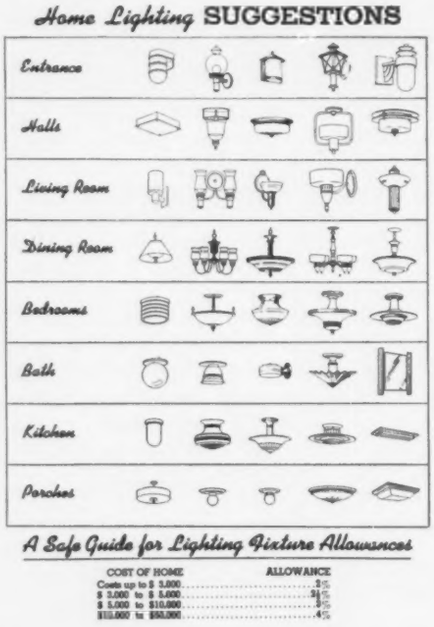
"The two main switches (600 amp. and 400 amp.) were some distance apart so that it was deemed advisable to install a 1200-amp. main switch branching to the present main switches.

"We found that by using RW wire we could install nine No. 4/0-conductors in the 4" conduit and six No. 4/0-conductors in the 3" conduit. Then, by using one No. 4/0-conductor in each conduit for the high potential leg to ground, one No. 4/0-conductor in the 3" conduit, and two No. 4/0-conductors in the 4" conduit for the neutral and two No. 4/0-conductors in the 3" conduit for each 110-volt-to-ground leg and three of the conductors in the 4" conduit for each of the 110-volt-to-ground legs that we would have the maximum amount of conductivity available for the existing ducts. Under the old code this would have allowed us 1125 amp. of capacity for the 110-volts-to-ground conductors, 675 amp. for the neutral and 450 amp. for the high potential.

"However, under a strict interpretation of the 1940 code these carrying capacities would be greatly reduced. For instance, the conduit is in a position that the ambient temperature surrounding it would frequently be between 40° and 45° C. Thus, the allowable current carrying capacity of the No. 4/0-wire would be reduced to 50% of 160 amp. which is the new current carrying capacity of No. 4/0 wire, or 80 amp. In the conduit carrying six conductors this would be reduced further to 80% of 80 amp. or 64 amp. In the conduit carrying a conductor this would be reduced to 70% of 80 amp. or 56 amp.

"Thus, the total carrying capacity of the five No. 4/0 conductors in multiple would be equal to 64 plus 64 plus 56 plus 56 plus 56 or 296 amp.

"I believe you will agree that a reduction of current carrying capacity from 1125 amp. to 296 amp, is excessive."



FIXTURING GUIDE—Increased fixture purchases are being felt in southern California as a result of cooperative promotion sponsored by the fixture manufacturers. Better fixtures, both from the standpoint of real lighting and of cost are sold since this promotion started as a result of the loss of fixture business to the portable lamps during recent years. A list of the members of Lighting Fixture Industries of Southern California is printed on the back of the sheet.

● IMPERIAL VALLEY CHAPTER, International Assn. of Electrical Inspectors was reorganized at a meeting not long ago after having disbanded. Officers selected were W. T. Johnson of El Centro, chairman; L. A. Montgomery of Brawley, vice chairman; B. C. Ferguson, El Centro, secretary-treasurer.

● UTAH's representation at the Pacific Regional Conference of I.E.S. in San Francisco was carried by Mr. and Mrs. Douglas Peck, proprietors of Peck Electric Co., Provo, Utah.

Sales Training

A series of electrical dealer sales training classes was held in the auditorium of the Boise, Idaho, division office of Idaho Power Co. First meeting of the series was a discussion of the La Salle Principles of Selling course and was presented by R. A. Hogg, Boise division sales supervisor. Salesmen Frank Dellenbaugh and Don Baird assisted in the presentation.

Willis Peterson and W. S. Janssen conducted the second meeting, presenting a playlet portraying the range sales story. A film on the "customer coverage" story was next shown the group. At a following meeting, the part the home service department plays in following up dealer sales was explained by "Tiny" Murphy and Gertrude Johnson. Following this series, a dinner, prepared and cooked by dealer salesmen, was held in the auditorium.

According to the company bulletin, similar meetings throughout the entire year will be held to discuss sales problems and secure additional sales training.

● "NO SHORT CUT," a safety picture, released as the second in a series of employee-training films, on April 1 by Pacific Gas and Electric Co., produced by Photo & Sound, Inc., is to be shown to the company's 13,000 employees. It is the first safety film production as a part of the company's accident prevention campaign. P.G. and E. previously has used bulletins, posters, meetings, and other means of educating employees about accident prevention. "No Short Cut" runs 35 minutes, was filmed on 16mm. Kodachrome, written and directed by Tom J. Ayres. Marvin Becker and Frank Wulzen were in charge of photography. Narration is by John B. Hughes, radio news commentator.

● PUBLIC SERVICETTES is the title applied to a newly inaugurated organization of 144 women employees of the Public Service Co. of Colorado. The organization was launched at a special luncheon at which officers of the company expressed their hopes for the success and lauded the program undertaken by the women's organization. Mildred Quist, bookkeeping department, is president, Ruth Kelley, vice president, and Julia Hager, secretary-treasurer. President and general manager, Guy W. Faller, G. B. Buck, vice president and general commercial manager, and J. E. Loiseau, vice president and secretary, addressed the initial meeting.

● INDUSTRIAL EXECUTIVES in the manufacturing plants of the southeast district around Huntington Park and Vernon, Calif., were sent a cooperative letter by W. J. Treatheway, city electrician of Huntington Park. In it he called to their attention the necessity of adequate inspection of electrical equipment under the hurried conditions of defense program, to prevent breakdowns which would slow up production, eliminate danger to workmen, and equally important, prevent sabotage by periodical checks. A list of 17 recommendations were made in respect to the electrical systems and an offer of assistance made to the executives by the city electrician.
● PUBLICATION of a monthly suggested price list is again being undertaken by the Vancouver Electrical Assn. The idea was abandoned once due to extensive and continuous changes in the price field. It is now felt that stability can be relied on and the association has commenced republication of its standard list.

OEL Chairman

Reed Smith chairman for '41

Reed R. Smith, former manager of the appliance department of the C. C. Anderson Co. and now manager of the recently organized Wright Electric Co., 366 24th Street, Ogden, Utah, was chosen chairman of the Ogden Electrical League at its annual meeting, February 20. Smith replaces Vern C. Brown, Brown's Radio Studios, Inc., who automatically becomes a vice-president on the Board of Trustees of the Electrical League of Utah.

Fred Schoss, manager of the Schoss-Rea. Electric Co., who served as the organization's first chairman in 1939 and as a vice-president in 1940, was selected to head the group's Membership committee. A. N. "Scotty" Vendall, Utah Power & Light Co., Ogden division, was re-elected secretary-treasurer.

L. W. Nims, liaison officer for the Utah Power & Light Co., spoke on the subject, "Electrical Power for National Defense."

SMITH

Simplified Conductor Sizes

In order to facilitate the national defense program, the adoption of a simplified list of stock sizes of copper conductors has been proposed as a means of reducing unnecessary inventories of copper wire, thus effecting economies and conserving material, according to an announcement by the National Bureau of Standards, Department of Commerce.

The proposed simplified list was drafted at a general conference held under the auspices of the Division of Simplified Practice and is now being submitted to the industry, in the form of a proposed simplified practice recommendation, for consideration and acceptance.

The National Electrical Contractors Assn., sponsor of the proposed recommendation, called attention to the fact that appreciable copper tonnages are now tied-up in inventories of slow moving sizes, mostly in the upper size range, whose place could more efficiently be filled, from an electrical standpoint, by smaller cables connected in multiple. They, therefore, suggested the adoption of a simplified list of 19 stock sizes of copper conductors in the range from No. 14 to 500,000 cir. mil., also that sizes larger be not carried in stock, but should be available only on order.

The general conference, called to consider this suggestion, consisted of representatives of manufacturers, distributors, users (including Governmental agencies) and others interested. After thorough consideration of the relative demand for the various sizes proposed for inclusion in the simplified list, the conferees unanimously decided that the demand for sizes No. 5 and No. 3 was not sufficient to warrant their retention. With this modification, the suggestions of the sponsoring group were drafted into a recommendation, to become effective for new production for stock, June 1, 1941, subject to approval by the industry.

Agenda

Utah Chapter, I A E I—M. E. Dansie, Vance Electric Service, spoke on "Overcurrent Protection" at May 6 meeting. Art Schanuel, field representative for National Adequate Wiring Bureau, presented "Adequate Wiring on a National Scale" at May 22 meeting.

Electrical Estimators, Los Angeles, May 15—Bassil Wright, coordinator, Major Disaster Emergency Council for Los Angeles area, spoke on Council plans.

Southern Calif. Chapter I A E I, Long Beach, Calif., May 21, subject of the meeting "Inspectors Problems."

Electric Club of S.F., May 12, Chet Coons, Safety Live Line Tool Co., showed color movies taken on the recent Chamber of Commerce good-will tour of Mexico. May 5, Sam G. Hibben, Westinghouse director of applied lighting, presented developments in "Light and Defense."

Electric Club of Los Angeles, May 12, program on better vision included as speakers Dr. Harry E. Goodman, optometrist; Capt. W. P. Walsh, and Geo. Campbell, a young lad who was blind for the first 18 of his 22 years, who spoke on his first reactions to normal vision.

Electric Club of Wash., May 5, Seattle, speaker F. H. Ferguson, who presented a color film showing the laying of the new submarine power cable from Richmond Beach to President Point.

Electric Club of San Diego, May 6, Bill Guy and Graybar troupe from Los Angeles, presented a thespian endeavor "Double Exposure" or "It's Nice Work if You Can Get It." May 13, John Bayley, public relations supervisor, Southern Calif. Telephone Co., pressented three sound pictures "A New Voice for Mr. X," "What's the Technique?" and "New England Hurricane."

East Bay Electric Club, May 5, Oakland, Calif., "What the Shipbuilding Program Means to the Bay Area" was the topic of speaker James Moore, vice pres., Moore Drydock Co.

Rocky Mountain Electrical League, in a joint meeting with the Denver chapter, at Denver, May 12, was occasion for a formal acceptance by Pres. G. B. Buck on behalf of the League of "Supreme Honor" award bestowed by the American Trade Assn. Executives for "outstanding achievement and distinguished service rendered to the industry it represents, to commercial and industrial development unto the public, during 1940."

Electrical Estimators', Los Angeles, May 1, a meeting at which electrical inspection problems were discussed and questions answered by R. H. Manahan, chief. dept. of electricity.

Pot & Kettle Clubs, annual convention in Portland, June 27-30, promises to be a highly successful summer gathering, both from educational and entertainment standpoint.

Amer. Society of Heating & Ventilating Engrs., San Francisco, May 6, "Salient Points in Connection with Reverse Cycle Heating & Cooling" was the topic of Howard H. Douglas, Southern California Edison Co., Los Angeles.

EMEA Dope Sheet—

Edited by Howard C. Park
EMEA of So. Calif.

[No. 5 of a series of boiled-down, practical work sheets worth keeping handy to use]

In the two previous Dope Sheets summarizing the 1940 National Electrical Code changes of particular significance to electrical maintenance engineers, the subjects covered included: Voltage drop, kind of installation governs type of insulated conductor, ambient operating temperatures determine insulation grade, allowable current carrying capacities, insulated wires classified as to wall thickness—with tables of approximate outside diameter and sq. in. areas over insulation, new conductor types, insulation and uses—in the March issue.

April continued the data with: Number of conductors in raceway affect current carrying capacities, maximum permissible conduit fill, and other tables, including one of corrections for ambient temperature.

If installation is made in location where ambient temperature exceeds 30C. 86F. the current capacities of the conductors are to be calculated according to the percentages of rated amperage capacity given in the following table.

Number of Conductors in Conduit or Tubing
Thin-Wall Types
"Performance" RPT and "Heat-resistant" RHT

Size of conductor	No. of conductors in one conduit or tubing								
	1	2	3	4	5	6	7	8	9
14	½	½	½	½	½	½	½	¾	¾
12	½	½	½	½	½	¾	¾	¾	¾
10	½	½	½	½	¾	¾	¾	¾	1
8	½	½	¾	¾	1	1	1	1	1¼
	Synthetic, type SN & Latex, type RU								
14	½	½	½	½	½	½	½	½	½
12	½	½	½	½	½	½	½	½	¾
10	½	½	½	½	½	½	¾	¾	¾
8	½	½	½	¾	¾	¾	1	1	1
6	½	¾	¾	1	1	1¼	1¼	1¼	1¼
4	½	¾	1	1	1¼	1¼	1¼	1½	1½
2	½	1	1	1¼	1¼	1½	1½	2	2
1	¾	1¼	1¼	1½	1½	2	2	2	2½
1/0	¾	1¼	1¼	1½	2	2	2	2½	2½
2/0	¾	1¼	1½	2	2	2	2½	2½	2½
3/0	¾	1½	1½	2	2	2½	2½	3	3
4/0	1	1½	2	2	2½	2½	3	3	3

Note—Types RPT and RU recognized #14–10.
Type RHT recognized #14–8.
Type SN recognized #14–4/0.

Percentage of Cross-Sectional Area Conduit-Fill

Nature of conductor or installation	Number of conductors				
	1	2	3	4	over 4
Standard conductors (not lead covered)*	53	31	43	40	40
Lead covered conductors*	55	30	40	38	35
Rewiring only—with thin-wall conductors	60	40	50	50	50

Per Sec. 3005-d and e.
*For new-wiring or rewiring using standard wall insulation and RHT for new wiring. Below dotted line rewiring existing raceways only.

For Not More Than Three Conductors In Raceway or Cable

Wire size AWG.	(1937) ("Code") (type) (R)	Allowable Amperes—1940 National Electric Code								
		"Code" grade rubber, R–RW			Syn., SN Latex, RU Rubber, RP–RPT			Heat-resistant rubber, RH–RHT		
	(Any no. wires)	86F. 30C.	104F. 40C.	113F. 45C.	86F. 30C.	104F. 40C.	131F. 55C.	86F. 30C.	122F. 50C.	158F. 70C.
14	(15)	15	11	7	18	15	7	22	16	8
12	(20)	20	14	10	23	19	9	27	20	9
10	(25)	25	18	12	31	25	13	37	27	13
8	(35)	35	25	17	41	34	17	49	37	17
6	(50)	45*	32	22	54	44	22	65	49	23
4	(70)	60*	43	30	72	59	29	86	64	30
2	(90)	80*	57	40	96	79	39	115	86	40
1	(100)	91*	65	45	110	90	45	131	101	47
1/0	(125)	105*	75	52	127	104	52	151	113	53
2/0	(150)	120*	85	60	145	119	59	173	130	61
3/0	(175)	138*	98	69	166	136	68	199	150	70
4/0	(225)	160*	114	80	193	158	79	230	172	80
Mcm.										
250	(250)	177*	126	88	213	175	87	255	191	89
500	(400)	265*	188	132	319	262	131	382	286	134
750	(525)	330*	234	165	398	326	163	475	355	166
1000	(650)	377*	302	188	455	373	186	543	407	190

*Note reduction in allowable current carrying capacities.

● "The Air We Breathe" was the general subject upon which three speakers addressed the May 20 meeting of the Electrical Maintenance Engineers' Assn. of Southern California in Los Angeles. W. P. Edgecomb of Westinghouse described the theory of the Precipitron electric air cleaner and the general subject of air conditioning. J. Frank Park of Western Air and Refrigeration Co. talked of the application of the precipitron to air conditioning. Plans were also made to have R. V. O'Mara of Western Precipitation Co. discuss the industrial phases of air cleaning. Glenn Farr, president, was in charge.

● Northern California Electrical Maintenance Engineers Assn. held an important business meeting May 15 to determine qualifications and dues for associate memberships, types of programs, meeting place and price of dinner, dues and to hold an election of officers. Al Biddle, president, conducted the meeting and general discussions ensued on each of these subjects.

LIGHT for DRAFTING

Incandescent

The Need

Glare-free illumination for drafting to an intensity satisfactory for easy, accurate and speedy vision.

Conditions

Room approximately 144 by 156 ft. with 12 ft. 6 in. ceiling. The ceilings are accoustical tiles of good reflection factor and the side walls are warm white.

Installed

Fixtures on 12x12-ft. centers, are Westinghouse M.B., with 1000-watt T24 bipost lamp; 182 installed.

After six months of continuous use the system provides better than 45 ft-candles.

Who

Vultee Aircraft, Inc., Downey, Calif. Gordon Kaufman, architect, Elliott Lee Ellingwood, electrical engineer.

LIGHT for CUTTING

Incandescent

Who

Alice Frock Co., 341 Twelfth St., Oakland, manufacturer of women's dresses. Layout by H. W. Henderson, Pacific Gas and Electric Co., Harry Clifford, electrical contractor.

The Need

Ample illumination for quick, easy seeing by operators using high speed cutting machines in cutting dress materials in bulk from patterns along long tables. Color matching important.

Conditions

Ceiling unfinished, open wooden joists and flooring, poor reflection factor; walls light colored paint. Eleven foot space has live trolley wires for electrical feed to cutting machines, pipes etc. Space 1,280 sq. ft., 16x80 ft.

Installed

Sixteen 500-watt silver bowl lamps in industrial RLM reflectors mounted on conduit and outlet boxes 10 ft. from the floor on 8x10-ft. spacing over the two cutting tables; 8,000 watts replaced 600 watts of bare lamps.

Results

After 500 burning hours 70 ft.-candles over center of the tables, 40 at sides of the room. Operators volunteered the information that since its installation eye strain and headaches have disappeared. Management declares output has increased and errors have been reduced, wastage lessened.

ELECTRICAL WEST

McGRAW-HILL COMPANY OF CALIFORNIA
68 POST ST. SAN FRANCISCO

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Conventions and War

CALL it defense or war, the topic dominates everything these days, even conventions such as that of the Pacific Coast Electrical Assn. at Coronado. There an obligato to the convention session talk was played by the roaring navy planes overhead, planes from nearby North Island naval base and from adjacent San Diego's huge airplane factory. Occasionally this bass tympany drowned out the solo voices of the speakers, talking of the problems brought by the defense effort to the peacetime electrical industry.

But throughout the sessions, particularly in those working sessions, the conclave meetings on Thursday, the practical and realistic contributions that the industry is and can make to this supreme effort were talked about and ideas interchanged.

Headliner speakers at the general sessions, in discussing the electrical industry's contributions to progress, touched upon not only the past, but talked of the industry's eagerness to contribute materially to the immediate future that is so dedicated to defense effort. Contractors, manufacturers and utilities through their representatives, expressed their sincerity in giving all possible aid to the government in this critical time.

Patriotic inspiration was given the convention by the fervent words of a new American who told by contrast and by historical background why Americans should be strong in defending their priceless possessions of freedom. Taken so much for granted by this generation, these liberties may be accepted as some divine right, some dispensation that cannot be taken away. Those who have lost these liberties know too late what treasure they have given up far too cheaply, how expensive the cost in human blood to regain them.

In the conclave meetings the practical ways to serve and to increase the nation's efficiency and production were touched upon in every group. Engineers by safeguarding reliability of service to defense industries, by increasing power production; sales and administrative groups by economies and distribution of lighting and other essential equipment, each enlisted in the all-out effort to return the world to sanity by giving everything the industry has to win the war now, that we may return the sooner to pursuits of peace.

Some Uninvited Assistance

TO ENDEAVOR to rationalize the processes or actions of a zealot is about like trying to control the light output of a glow worm, as two Pacific Coast cities can bear ample testimony. Apparently whether the citizen-voters like it or not, both San Francisco and Spokane are going to be helped into municipal ownership of their electric distribution facilities if the federal government and some of its officials can accomplish it.

Having turned down municipal ownership twice in the last year, the last time by a vote of 3-to-2, Spokane is receiving congressional help to "change its mind." The help is to be a $2,000,000 transmission line from Grand Coulee to Spokane. Congressman Rich of Pennsylvania attempted to have this item stricken from the Bonneville Power Administration appropriation but his efforts were beaten under the power bloc leadership of Representative Leavey of Spokane and Representative Rankin. Mr. Leavey's justification for the item was that the people of Spokane "of course will come again and demand this Grand Coulee power."

San Francisco's case now becomes a dilemma. Eight times voters have said "No" to propositions dealing with one phase or another of municipal distribution of Hetch Hetchy power. Secretary Ickes, having won a court decision that the present method of disposing of this power was illegal, and cognizant of public attitude, agreed to the general conditions of a leasing arrangement. When the lease was prepared and submitted for final approval, the Secretary changed his mind and declared that it too, in his opinion, was illegal. Thus San Franciscans face an unjustified increase in

their tax rate, the expense of an election and possible seizure of their by-product electric plant because the Secretary thinks municipal ownership is the answer to a legal problem that could be solved by a simple Congressional amendment.

And we are told that the national defense effort is essential for the preservation of democracy!

Tax Innovation

WHEN customers of the Mountain States Power Company receive their June bills, they are likely to be impressed by two things—(1) a substantial reduction in rates and (2) an innovation that at least is educational. For the first time the bill will consist of two items—a charge for energy and a charge for taxes. For years the utilities have been choice meat for the tax-collecting agencies of government. The tax-levying groups early learned that the power and gas companies could be made into convenient tax-collecting bodies themselves, with little complaint from the public unless it was that rates were high. Certainly the public was not conscious of the tax.

No amount of talking that the utilities have been able to do has awakened the public to the degree of this tax grab. The proportion of utility gross revenue that has been turned over to government has grown from 10% just a few years ago to 16, 20 and even 24% in the case of some companies. Because 16.75% of Mountain States Power's revenue from energy sales goes to taxing agencies in the case of its Willamette division, the customer's bill for 100 kwh. will not read just $3.39 but will show a $2.90 item for energy and a 49-cent item for taxes.

Establishing this kind of tax consciousness has long been a serious problem. In these days of ever-mounting levies the plan of Mountain States Power will be watched with interest. The oil companies have sold their product that way for many years. Perhaps the electric utilities can do the same.

New Interest in Ranges

SIGNIFICANT thing about the highly successful range campaign in northern and central California, especially in the farm regions of the valley, was that it brought all branches of the electrical industry together, dealer and salesman, wholesaler and manufacturer, and the utility, in a combined effort against a new and serious competitor, bottled gas. And in the tilt between electricity and liquid fuel, electricity came out nicely and made real gains despite lower price of merchandise to compete against.

Without such an industry-wide drive for the past few seasons dealers had been weaned away to the competition too. There seemed to be a chance to sell some merchandise for which the bottled gas interests were out creating a market. Nobody was doing much about electric ranges at the time.

The dealer meetings stirred up interest again. They refreshed the view as to the opportunities there were for profitable sales. They dramatized the excellent new qualities available in electric ranges. There was a unified campaign throughout all of northern and central California. It tied in too with another range campaign in Southern California.

Organization and mass action sweeps all before it. It is true in selling as it is in military campaigns. There should be more such coordinated programs.

Animated Annual Reports

ONE of the corporate documents that has received a real face-lifting has been the annual report. The crop of 1940 reports from far Western utilities is no exception. Aimed at really informing both stockholders and employees, many of these documents are as attractive as the most modern picture magazine. Stodginess that was so typical of former reports has flown. Succinct and noteworthy facts are set off in a manner that will assure that they are remembered. Color and pictures are used to advantage. Charts that heretofore have been intelligible only to an engineer or an accountant have been animated and popularized. While the customer ownership programs of former years will make some of these reports available to large blocks of customers, it is unfortunate that all customers can't receive them. If they could, they would better understand some of the functions and problems of the utility business.

SPEAKING personally, I have been greatly troubled when realizing the vast expenditures made in the name of preserving democracy in this land and other countries and, at the same time, view with concern the effect of forces which are trending towards the destruction of private enterprise in this country. I believe that the cause of democracy and that of private enterprise are fundamentally one and the same. If you destroy one, you destroy the other.—J. Frank McLaughlin, president, Puget Sound Power & Light Co.

NEWS *of the industry*

OREGON PUD LOSES BY THREE TO ONE VOTE

By the substantial majority of 3 to 1, Baker County, Ore., voted against formation of a PUD at a special election, May 27. Final vote was 2,393 "No" to 808 "Yes." The measure lost in both towns and rural districts.

As has been customary in recent elections, the Bonneville Administration was active in promoting the PUD. Carl D. Thompson, secretary of the Public Ownership League of America, and Morton Tompkins, Oregon public ownership advocate—both on the Bonneville payroll — spent days in the county working for it. D. L. Marlette, executive assistant to Administrator Paul D. Raver, spoke on the radio. Walter Pierce, U. S. Congressman from eastern Oregon, made speeches favoring it, and these were distributed as extracts from the Congressional Record.

Eastern Oregon Light & Power Co., which serves the area, together with a citizens' committee, opposed the PUD.

The election further emphasizes Oregon's disinclination for public power ownership. In 21 areas with 765,000 population, three-quarters of the state total, there have been 36 elections with 29 defeats of PUD's In the seven areas where districts have carried, population totals but 72.000 Two possible elections may yet be held, one in Pendleton and the second in west Umatilla.

USBR GETS $5,000,000 FOR BULLSHEAD DAM

Bullshead Dam, scheduled in the Interior Department appropriation bill for an initial $5,000,000 and estimated to cost ultimately $41,200,000, will be a power development project located on the Colorado River on the Arizona-Nevada line. Newest project of the USBR, Bullshead will be a straight power undertaking with only incidental benefits to irrigation and flood control. Under present plans the entire cost will be repaid from power revenues in 50 years with interest at 3 per cent.

The dam will be an earth and rockfill structure 338 ft. high, 1,350 ft. long, 60 ft. wide at the crest and 1,400 ft. wide at the base. It will impound 1,600,000 acre-ft. with the reservoir reaching upstream to the Boulder plant tailwater. The resulting 140-ft. head will be used to generate initially 180,000 kw. in four generators. Ultimate capacity will be 225,000 kw.

During construction the river will be diverted through six tunnels in the west canyon wall. One of these will later be used to house a valve-controlled steel pipe for by-passing the generators. The other tunnels will contain penstocks. Of the total cost it is estimated that $21,000,000 will be for the dam and reservoir, $15,500,000 for the powerhouse and the remainder for electrical equipment.

TACOMA RUSHES WORK ON NISQUALLY PROJECT

Despite the suggestions of Secretary of Interior Harold L. Ickes, that the city of Tacoma, Wash., postpone the development of a new $90,000 k.w. hydro-electric project on the Nisqually River until the "conclusion of the present emergency," the Tacoma city council has unanimously approved an ordinance clearing the way for an $11,000,000 city power expansion program. However, taking cognizance of Secretary Ickes appeal, the ordinance included a proviso that plans will be halted should they interfere with national defense program. Secretary Ickes also suggested that the project be delayed until further study is made concerning a tie-up with the Bonneville-Grand Coulee federal system. R. D. O'Neill, public utilities commissioner of Tacoma, has claimed the city system can manufacture power cheaper than it can buy it from the Federal government. This project calls for construction of a 40,000 kw. generating unit as an addition to the existing Nisqually powerhouse at La Grande; a concrete diversion dam 275 feet high on the Nisqually River, with tunnels and pressure pipes extending 7,200 ft. to the present powerhouse; a concrete impounding dam 300 ft. high on the Nisqually River, 4 miles upstream from the existing powerhouse and a powerhouse of 50,000 capacity below the dam.

● AN ELECTRIC FURNACE was added to the existing open hearth melting facilities of the Pittsburgh, Calif., plant of the Columbia Steel Co. The new furnace, a standard-type Heroult will contribute to prompt execution of casting orders requiring special steel compositions including alloy steel.

ICKES SAYS "NO" TO HETCH HETCHY LEASE

San Francisco's proposed lease of the city distribution facilities of Pacific Gas and Electric Co. fails to comply with the terms of the Raker Act according to an "informal" opinion expressed by Secretary of the Interior Ickes, following a two-day conference on the lease in Washington. Earlier in the year the Secretary had approved in principle the terms which later were written into the lease.

In negotiations that followed, Secretary Ickes agreed to join the city in petitioning the court for a further extension of an injunction that would be effective June 30 against sales of power through the present agency contract. This action is contingent upon the city holding an election in November on a revenue bond issue for purchase of the PG and E distribution system and active support of the proposal by city officials. Only alternative to this program was an increase of 32 cents in the city tax rate to cover loss of power revenue.

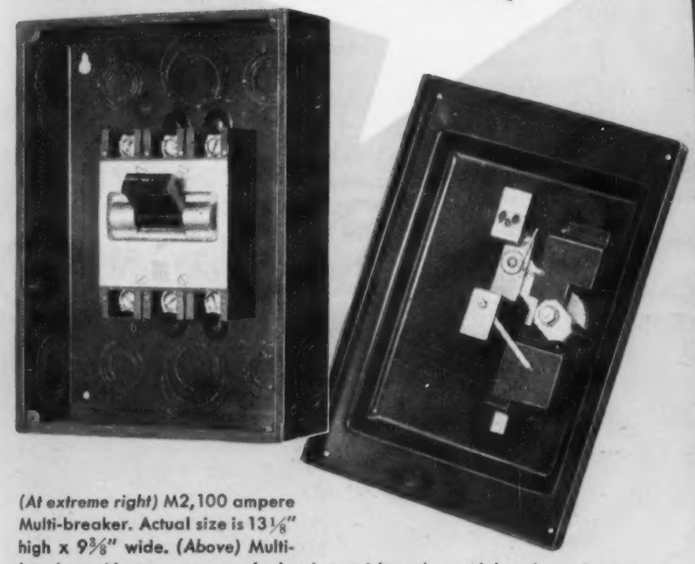
At the Washington conference which had been called by Secretary Ickes, the lease was defended by 11 civic organizations and opposed by several advocates of municipal distribution. Chairman Leland Olds of the FPC testified at the hearing that "the proposed arrangement offers the city none of the advantages of public distribution" and charged that the "proposed agreement is patently nothing more than an attempt to evade the terms of the (Raker) Act, and by a legalistic and technical device to cloak such evasion with a semblance of legality." In a separate memorandum Olds objected to the charge for standby power contained in the lease, to the rental figure, and to the terms which he insisted would restrict marketing of future public power.

According to press reports Secretary Ickes, condemned San Francisco newspapers for failure to support public ownership measures, asserted that the city "had missed the boat" by not applying for PWA loans or grants and pointed to the TVA as an example of what might have happened in San Francisco.

● POWER SYSTEMS for Seattle City Light and the Bonneville-Grand Coulee Administration were interconnected May 18 to permit interchange of energy.

SQUARE D *Offers*

A NEW LOW COST INDUSTRIAL MULTI-BREAKER



(At extreme right) M2, 100 ampere Multi-breaker. Actual size is 13⅛" high x 9⅜" wide. *(Above)* Multi-breaker with cover removed, showing quick make and break mechanism designed especially to prevent injury of breaker lever.

A COMPACT CIRCUIT BREAKER TO MEET ALL 230 VOLT A• C• REQUIREMENTS

- No parts to replace after short circuit or overload.
- Thermal element (bimetal) affords time lag on momentary overloads. New magnetic feature assures instantaneous trip on heavy short circuits.
- Window signal on name plate indicates "tripped."
- Breaker units are common trip—cannot cause single phasing of circuits.
- Front operation permits close ganging.
- Provision for padlocking in "on" or "off" position.
- Dust-resisting construction; felt gasket between box and cover.
- Compact—50 ampere size measures only 11⅛" high x 6⅝" wide. The 100 ampere size (as illustrated above) measures 13⅛" high x 9⅜" wide.

Immediate Delivery On All Sizes
—Notice Low Costs

Frame Size	Amps.	2-Pole List Price	3-Pole List Price
M1 50 Ampere	15-25 35-50	$10.00 14.00	$15.00 19.00
M2 100 Ampere	50-100	24.00	33.00

Your Square D distributor is displaying and stocking the new Multi-breaker. Ask him for details or write us for Bulletin 3200.

SQUARE D COMPANY

LOS ANGELES - MILWAUKEE - DETROIT

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

CALL IN A SQUARE D MAN

LOS ANGELES, MONTANA, AND ARIZONA RATES CUT

Downward rate trends continue and several communities announced reductions during the last month. Included were the following:

Los Angeles Bureau of Power & Light announced the spread of a $1,044,000 annual reduction over various classes of business. Residential customers will receive $418,000, the average user of from 25 and 100 kwh. monthly saving 6 to 9 cents. The minimum of 55c remains unchanged but the initial rate block of 4.4c is divided as follows: for the first 13 kwh. or less, 55c; for the next 22 kwh., 4.1c; all in excess at present rates. Commercial lighting customers receive the benefit of $469,000, a 4% reduction and street lighting, $157,000 or 9%.

Montana Power Co. put into effect a $339,000 reduction in May. Residential minimum was reduced from $1 to 75c per month for the first 12 kwh. or less with block charges of 4.5c for the next 48 kwh. (a reduction of 1c); 3c for the next 90 kwh.; 2c for the next 100 kwh. and 1.5c for all additional use. A 1c rate for water heating applying to energy in the 250-650 kwh. block was also included.

Central Arizona Light & Power Co. initiated new schedules which saved customers in Phoenix and other communities $90,000 annually. Principal change was the reduction in the energy charge for the first 120 kwh. from 3.5c to 3.3c per kwh. Small reductions were also made in the commercial lighting and general power schedules.

Bonneville Signs More New Power Customers

Operations of the Oregon Shipbuilding Co. on the Willamette River in Portland will be energized by Bonneville power as the result of a contract for from 6,000 to 10,000 kw. of demand executed by Edgar Kaiser and Administrator Paul J. Raver. Construction power for the new yards had been supplied by Portland General Electric Co., whose facilities were already available. Bonneville must build to the yards. Rate to be paid for power will be 75c per month per kilowatt of demand plus 2½ mills per kwh. for actual power usage.

Other recent Bonneville activities included the signing of a one-year contract with the Cowlitz County (Wash.) PUD for 3,000 kw. Energy will be supplied over a 35-mile line now under construction from Chehalis to Longview to provide power for the Reynolds Metals Co. aluminum plant. The PUD operates a 30,000-kw. steam plant at Longview.

Officials of Grand Coulee City signed a 20-year contract for the purchase of 425 kw. despite protests of the option holders of $400,000 of the city's revenue bonds that the rates proposed were insufficient to cover the costs and fiscal charges. Income from the sale of the bonds is to be used to buy the system from the present owners. Officials countered the protest of the bond company with the statement that if the options were not exercised, the assistance of the Bonneville administration would be secured in placing the bonds with the RFC.

Lewis County (Wash.) PUD became the sixth PUD to receive Bonneville power when a 27-mile transmission line from Chehalis to Mossy Rock was completed. This PUD has 1,350 customers.

Major new Bonneville construction project is a 230-kv. line between Grand Coulee and Covington, Wash., bids for which were taken on June 6. The line will be 183 miles long and will include 850 steel towers. Estimated total cost is about $1,944,000.

Plans Set for June Air Conditioning Show

The Pacific Heating and Air Conditioning Exposition, to be held at Exposition Auditorium, San Francisco, June 16-20, will feature exhibits of interest to two parallel meetings: American Society of Heating and Ventilating Engineers, Palace Hotel; Heating, Piping and Air Conditioning Contractors National Association, Hotel St. Francis. Both ASHVE and ACNA are holding their respective meetings on June 16-20 to permit arrangement of the triple-feature conclave. According to sponsors of the Exposition, it has been organized to present a systematic review of new and authentic methods and equipment for heating and air conditioning. Admission will be by invitation and registration, and registration may be made at the door during days when exposition is in progress.

● Telluride Power Co., Richfield, Utah, has been ordered by the Public Service Commission of Utah to file a statement of original costs of its properties together with other facts and figures to be used in determining the possibility of a power rate reduction.

● Case against the San Francisco Electrical Contractors has been set ahead again until July at the request of the Government. This makes the fourth or fifth delay at the request of the Government.

NEW POLICY PROPOSED FOR LOS ANGELES POWER BUREAU

Relationship approximating that between stockholders and a private corporation is urged for the people of Los Angeles and the Department of Water and Power in a report prepared for Mayor Bowron by the city Bureau of Budget and Efficiency. The study covers financial relationships between the city and the department as well as policies and practices.

Recommendations include:

(1) The mayor and council as official representatives of the "taxpayer-stockholders" should assume the normal functions of a directorate of the city's municipal utilities, particularly with reference to determination of the policy of distribution of net earnings.

(2) The powers and duties of the citizen commission (the Board of Water and Power Commissioners) be limited to policy determination within the Department of Water and Power, primarily as an agency of the mayor and council.

(3) The functions of the Department of Public Utilities and Transportation be extended to include publicly-owned as well as privately-owned utilities, limited to the extent of acting as an investigating and regulatory fact-finding body.

(4) Provisions be made for inclusion in the operating expenses of the two publicly-owned utilities of items for their proportionate share of city taxes and the payment of franchise fees, as a fixed local policy and practice.

Bonneville Customer Claims Lowest Rates

What are claimed to be the lowest rates in America for residential usage in excess of 250 kwh. monthly have been established by the Canby, Ore., municipal system, distributors of Bonneville power. The new schedule follows: first 50 kwh. 2½c per kwh.; next 50, 1½c; next 100, 1c; next 600, ½c and all in excess of 800 kwh. monthly, ¾c. Minimum bill is 75c per month.

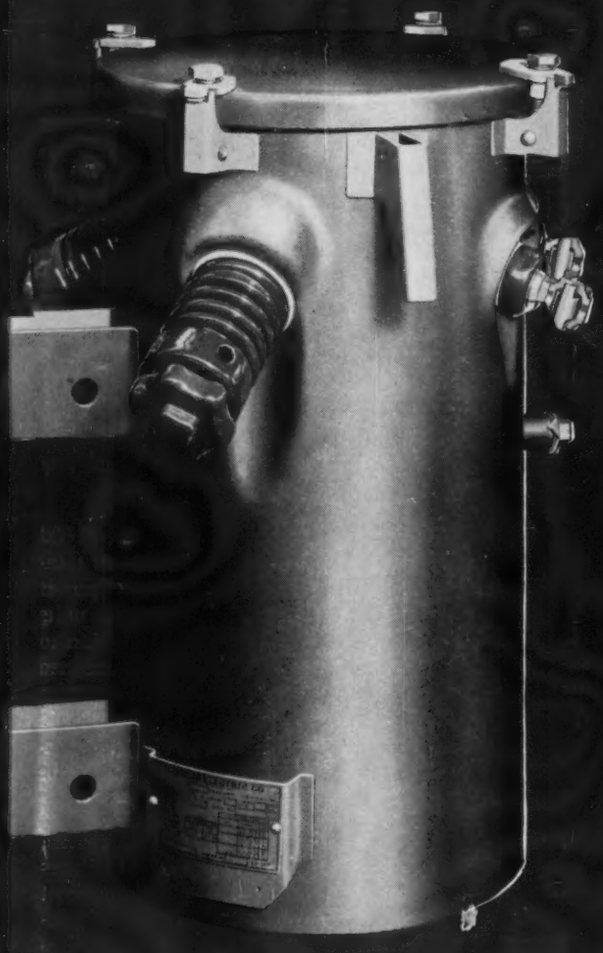
Ability of Canby to charge such low rates is attributable to the fact that its distribution system is virtually debt-free and is operated in conjunction with a municipal water system. Also maintenance is a minimum, the system having been rebuilt last year by WPA virtually at no cost to the community. The system has 308 residential customers and 102 commercial and industrial users. Bonneville power is delivered over facilities of the Portland General Electric Co.

Kuhlman Transformers

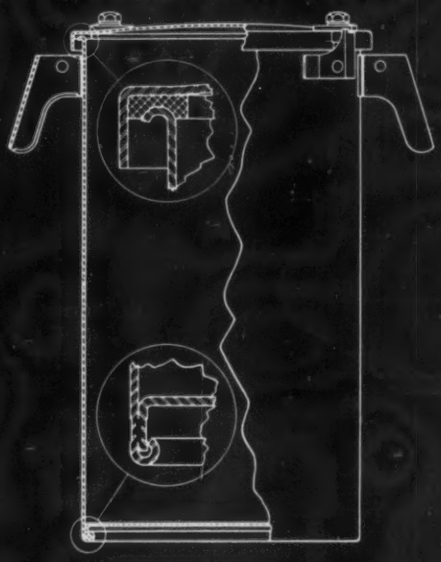
DESIGNED AND BUILT FOR LOWER MAINTENANCE AND LONGER LIFE . .

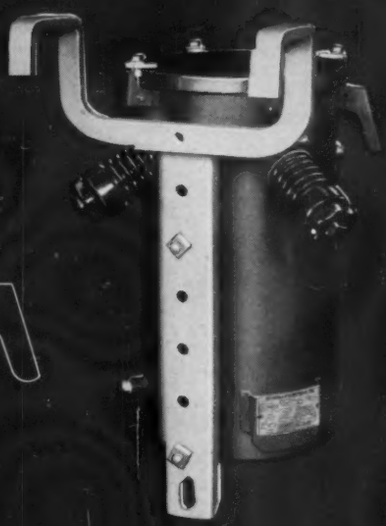
Utility maintenance men these days appreciate the importance of good construction in transformer tanks. For that reason no bet is overlooked in the construction of Kuhlman Transformer tanks. The entire tank and body is formed from copper bearing steel. The top edge is rolled to form a perfect gasket seat. The bottom is seam-welded and rolled to form a heavily reinforced base. Cover clamps are forged and machined from bronze—no part need be removed in taking off the cover. The lifting lugs greatly facilitate handling. The rigid steel cover banishes any danger of cover breakage. The pockets for the primary and secondary bushings are pressed directly into the tank body which not only eliminates welding, but the recesses provide ideal protection for the bushing gaskets. Perhaps the most important feature of Kuhlman tanks from the maintenance standpoint is the Porcelain enamel finish which guards the tank against the havoc of rust and corrosion. The T cross arm hanger, the direct pole mounting brackets, position of grounding studs and nameplate on Kuhlman tanks now conform to the new E. E. I.—NEMA standards.

For more complete facts about the advantages of Kuhlman Distribution or Power transformers write to **KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN.**



(Below) Drawing showing construction of tank and top and bottom seams. Note how rolling at base increases strength — and how rolling at top provides perfect seat for gasket. Bronze cover clamps need not be removed in taking off cover.





(Above) Photograph showing detail of new E. E. I.—NEMA standard T cross arm hanger. Kicker bracket (not shown) is available. In every conceivable way Kuhlman transformer tanks are designed and built to assure lower maintenance and longer life.

WESTERN REPRESENTATIVES OF THE KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN

Denver, Colorado
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1921 Blake Street

Los Angeles, Calif
Thomas Machinery Co.
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San Francisco, Calif
Paul S. Everley
329 Minna Street

Portland, Oregon
W. J. Cottrell
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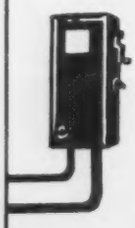
Bill-- Here's a tip to help you get that new plant operating sooner

"We've found that we can save as much as 50% of the time required for installing control by using G-E combination starters for the motors in our plant." ★

HERE'S WHY G-E COMBINATION STARTERS CAN BE INSTALLED MORE QUICKLY



THIS	Instead of	THIS
1	Devices to mount	2
2	Lengths conduit to cut	3
2	Conduit ends to thread	4
6	Wires to pull	9
6	Power connections to make	12

★ *Statement by R. L. Mitchell, master mechanic, Fernstrom Paper Mills, Inc., Pomona, Cal.*

GENERAL ELECTRIC

BOULDER DAM POWER RATES REDUCED IN NEW CONTRACT

Future operations of Boulder Dam power plant as well as new rates for falling water have been worked out in an agreement between the Department of the Interior and the Los Angeles Bureau of Power & Light and Southern California Edison Co., who will generate power as agents of the federal government. The agreement made effective the terms of the Boulder Dam Adjustment Act, which otherwise would have expired June 1. The act was passed by Congress after five years of controversy over power costs, operation, payments to Upper Basin states and interest rates.

The regulations provide for a reduction from 1.63 mills per kwh. for falling water to 1.163 mills for firm energy and from .5 mills per kwh. to .34 mills for secondary energy. The Interior Department estimates that the reductions will represent savings for power users of $120,000,000 over the 50-year period of amortization of the cost of the dam.

On integration of operations of the Boulder Dam plant with other facilities on the river, the agreement provides that "the United States may interchange power from Parker Dam and Bulls Head Dam for Boulder power allotted to the Metropolitan Water District, thereby assuring the government of practically full correlation of Boulder and downstream projects." Operations may be taken over immediately if the agencies fail to repair machinery which endangers human lives; after three days' notice if the agencies fail to comply with the integration program; after three days' notice if it appears they are breaching the contract to generate power for other groups to which Boulder power is allotted; and after 30 days' notice if it appears to the Secretary that an agent has committed any other breach of contract.

● FOUR GENERATORS rated at 60,000 kva. each have been ordered from General Electric for the Bonneville power plant. When installed in 1943, the units will bring the capacity of the station to its ultimate of ten units with a combined rating of 576,000 kva. The contract for the four machines was awarded on a bid of $2,858,300. Like the original six machines the four just ordered will be built at the Schenectady works.

● UTAH POWER & LIGHT CO., Preston, recently completely remodeled its offices and installed 144 40-watt fluorescent tubes, raising the seeing light to 40-ft.-candles. J. Homer Shaw, general sales department, designed the installation. Nancy Finch planned the color scheme.

NEVADA CALIFORNIA POWER PROPOSES FISCAL CHANGES

Plans for a general recapitalization program and change of name to California Light & Power Co. have been placed before stockholders of the Nevada California Electric Corp. by A. B. West, president. The name change is attributed to the fact that 87 per cent of the company's business is now in California; the recapitalization program is expected to provide a better balance in capital structure through a larger proportion of equity capital and to reduce money costs. Under the old funded debt costs have averaged the company 5.85 per cent while under the new plan it is believed they can be held below 4 per cent.

Recapitalization plans include:

1. Retirement of the present 105,023 shares of $100 par 7% preferred through exchange for a new $50 par 6% cumulative preferred in the ratio of one share of old preferred for four-fifths of a share of new preferred plus six shares of new $10 par common.

2. Clearance of $11 per share arrearage in dividends on the old preferred by payment July 1 of one-fifth share of the new 6% preferred and $1 in cash.

3. Creation of a new issue of $50 par 5% cumulative callable prior preferred as a medium of junior financing, 60,000 shares to go to underwriters at this time to provide about $3,000,000 of new money.

4. Sale to underwriters of $18,500,000 of new 25-year 3¾% bonds and of $4,000,000 of one to ten-year serial notes at an average rate of 2.6%.

● BOARD of Contracts and Awards, Tacoma, Wash., has placed an order with the Scoville Manufacturing Co., at Waterbury, Conn., for 40,000 pounds of non-corrosive, copper, nickel alloy condenser tubes for the department's steam plant. Delivery will be made subject to national defense priority rulings at the market price at time of delivery. It is estimated the pipe will cost about $10,000 and stated that delivery will be made sometime after Sept. 15.

● WEST COAST POWER distribution properties for service to 1,878 customers in Shelton, Wash., have been taken over by the Mason County PUD No. 3 for $275,000. A $385,000 bond issue financed the purchase and provides for line extension. The PUD has an agreement for surplus power with the city of Tacoma. The Mason County acquisition was the sixth negotiated purchase, as distinguished from condemnation, of privately owned utilities in the state of Washington.

Thanks Joe . . . we're already using combination starters . . . they're safer

"We have found that our men can maintain G-E combination starters without danger, thanks to the safety-interlocked enclosure which separate units do not have."★

1 SAFER because the circuit switch has ample capacity to interrupt stalled-rotor current of the controlled motor.

2 SAFER because the cover can't be opened as long as the switch handle is in the ON position and power is applied to exposed parts.

3 SAFER because, whenever the cover is open, power can't be applied to the starter by accidental closing of the switch handle.

★ *Statement by Raymond Dingler, chief electrician of a large western cement plant*

Send for "How to Get More for Your Control Dollar" (GES-2456) General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

CLATSOP COUNTY PUD PROPOSAL LOSES

Public ownership received another setback in Oregon when the voters of Clatsop County turned down a PUD proposal on May 6 by a plurality of 191 votes. Practically final returns showed 2,824 voting for the PUD and 3,015 voting against.

Five incorporated cities, Astoria, Seaside, Gearhart, Hammond and Warrenton, all returned "no" pluralities. The rural areas voted "yes," but by a margin insufficient to offset the "no" vote from the towns. Under the Oregon law the PUD is killed even for the rural areas, since the over-all vote of the proposed district was against the proposal.

Pacific Power & Light Co., serving the area under consideration, has properties in the district valued above $2,000,000. Bonneville has a transmission line to Astoria under construction. The company has contracted to buy 1,500 kw. of Bonneville capacity, and presumably will turn over to Bonneville the service that company is now supplying to Nehalem Valley Electric Coop., an R.E.A. project.

Colorado Rodeo to Be "Black Lighted"

The world-famous Ski-Hi Stampede at Monte Vista, Colo., will establish a new high in rodeo dramatics by applying modern electric wizardry to its August revival of bucking broncs-manship, calf ropery and other events commemorative of old Western roundup customs.

Electrical phases of the San Luis Valley event will be sponsored by the San Luis Valley chapter of the Rocky Mountain Electrical League. This newest RMEL unit will hold its first exposition on dates to coincide with those of the Stampede.

To develop spectacular electrical effects, much of the rodeo will be scheduled as night exhibitions. Plans call for "black light" on show animals, wild horses, their riders, and on the stadium in which performances will take place; also in parades through city streets. Phosphorescently-treated hoofs and brands are to be demonstrated under red and black rays to bring out contrasts and hidden color effects. Costumes of men and women riders, similarly processed, will add to the brilliant panorama. An electric brandiron stunt, to be conducted under black lighting influence, is designed to thrill and mystify night audiences.

Publicity build-up for the Stampede identifies it as "the world's first fully electrified rodeo". Daytime diversions at the San Luis Valley chapter's exposition, arranged in collaboration with Stampede authorities as added entertainment features, will include Public Service Company of Colorado's theatrical hi-tension show and well-glamoured displays of load-building appliances.

C. B. Lockhart, Monte Vista, is president of the RMEL's San Luis Valley chapter; H. E. Gumper, Alamosa, vice president, and Charles Pollard, Monte Vista, is secretary-treasurer. Their August celebration is being worked out with the aid of George E. Lewis, the League's manager.

Montana Now Has Chapter of AIEI

Montana Chapter of the I.A.E.I. held its first meeting recently at Great Falls with chairman C. L. Smith of Butte presiding. A Code discussion in the evening preceded talks on fluorescent lighting and auxiliaries by L. B. Johnson, General Electric Co., Salt Lake City; D. J. McGonigle, general sales manager, Montana Power Co. In the afternoon talks on the need for adequate wiring were given by R. E. McDonough, Montana Power Co., and on the new conductor insulations by A. W. Dunham, Anaconda Wire and Cable Co., Denver. A. E. Vieau, Crouse-Hinds, talked on explosion proof fittings for hazardous locations.

Chairman Smith appointed the following committee chairmen: executive, L. E. Montagne; public relations, A. J. Baker; legislative, A. L. Smith; membership, R. E. McDonough; code clearinghouse, C. M. Davis. T. A. Lloyd was elected second vice chairman and J. G. Clune, secretary-treasurer.

The Montana Electrical Assn., electrical contractors' organization, held its the chapter meeting.

● COWLITZ county (Wash.) PUD commissioners have voted to pay the new 2 per cent state privilege tax out of earnings from existing power and light rates instead of passing the tax on to consumers through increased rates. Harry Kelsey, manager of the district at Longview, points out this is equivalent to a 2% rate reduction and means a saving to customers of at least $20,000 a year.

● ANNUAL REPORT of the San Diego Gas & Electric Co. merits attention for outstanding design and illustrative material. Pictorially portraying national defense developments in its territory, and other leading industrial and agricultural achievements, the report sets a colorful standard for the industry.

EDISON BACK COUNTRY CLOSED TO VACATIONERS

Operating areas of the Southern California Edison Co. within the Sierra National Forest have been closed to general public use by order of Regional Forester S. B. Show, according to the announcement of M. A. Benedict, Sierra Forest supervisor. The areas closed are in Fresno county in the Big Creek area. The United States secretary of agriculture authorized closing the region to prevent malicious damage to utilities and other works located on national forest land or on private land within the forest boundaries which are important to national defense.

The area closed to the general public, except when entry is authorized by local forest officers, is in general those lands within a distance varying from 100 to 600 feet of all operating facilities of the Southern California Edison Co. at Florence Lake, Ward Tunnel, Bear Creek and Mono Creek dams and syphon. Also barred to the public are all power houses, dams, pipe lines, cables, syphons, transmission lines and other works in the Huntington Lake, Big Creek and Shaver Lake areas, except all portions within public roads.

Two Washington Utilities Make Rate Reductions

Reductions of 17 percent in light and power rates to users served by the Pacific Power & Light Company in Eastern Washington and Oregon became effective May 22. The revised schedule represented a saving of $410,000 to power consumers. Yakima and Walla Walla districts saved $225,000 and Oregon users, $185,000. This is the fourth cut made by the power company in the Yakima district since 1936 and represents a 34 per cent reduction from the 1936 figures. The new rate schedules affected 130 communities.

The Puget Sound Power & Light Company has also announced a 20 per cent reduction in power rates in Eastern Washington for irrigation pumping. This rate closely follows a slash in rates recently made for spraying purposes. Government agencies have stated that Puget Power's domestic and farm rates are the lowest for any comparable area in the United States.

● SEVERAL PRELIMINARY reports have been published by AIEE, 33 W. 39th St., New York. Included are: Apparatus Bushings; Protector Tubes; Switchgear Assemblies; Alternating Current Power Circuit Breakers; Insulator Tests.

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"Bridges a Century with Wire"

ROEBLING ELECTRICAL WIRES AND CABLES

100 years ago John A. Roebling founded the company which still bears his name.

» » Today, after a century of service, the name Roebling is still synonymous with leadership in wire manufacture, improvement and application.

» » In celebrating its 100th Anniversary, Roebling looks forward to the opportunity of serving industry in even greater measure than ever before.

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ONLY WATTHOURS *Metered.*

"ADEQUATE WIRING" LOADS ARE PAYLOADS WHEN METERED WITH . . .

ADEQUATE WIRING SERVES AND SAVES

ADEQUATE WIRING PAYS
DOLLARS SAVED
PER YEAR IN ONE BRANCH CIRCUIT BY REDUCING WASTE OF ENERGY
12 WIRE
14 WIRE
ADEQUATE WIRING REPORTER
First National Conference Spotlights Five Comprehensive Local Operations
A.W. Is Tops Warren, O., In Hartford's Licensed
ADEQUATE WIRING REPORTER
A.W. Rule Used In Architects Prize Contest
Minnesota A.W. Plan "Hits the Jack Pot!"
12,000,000 meters now in service are old and uncompensated, with load characteristics comparable to those indicated by the drooping curve. Considerable revenue losses often result from metering modern appliance loads with these uncompensated meters.
Certified A.W. Makes Headlines
Chicago Scene Philadelphia Keynotes A.W. Plan
The Inland Empire Sets New Record
WHETHER YOU BUILD, BUY OR RENT.. insist on Adequate Wiring
Enough Outlets
Enough Circuits of Large Enough Wire
Enough Switches
ADEQUATE WIRING REPORTER
Proves A.W. Has Definite Sales Appeal
Range Outlets Help Sell 88% on Electric Cookery
Certified Wiring Marches On!
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Builder Stars A.W. In Radio Promotion

CAR CARD: Brilliant red, yellow and blue, contrasted with black and white delivers a message with a wallop. Equally useful for window or store display. Standard size. Quantity cost: 25c

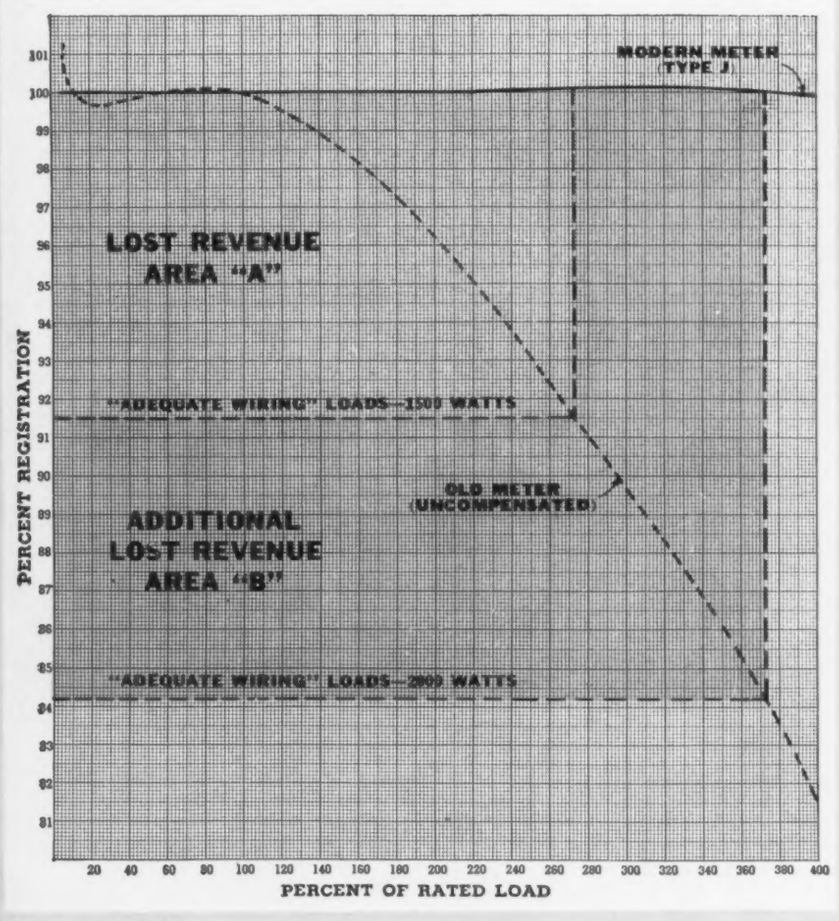
Single line imprint $8.00 per lot.

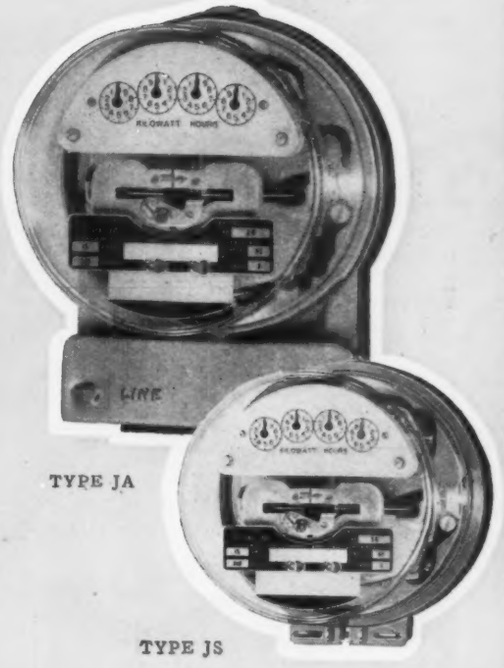
The car card is bold in neon of red, blue and yellow It makes a strong who runs appliance outlets, special outlets, radio outlets, telephone lets, switches, multiple sw The card to designate lighti lets carries the legend: "For Sight." A

SANGAMO ELECTRIC

..ADD REVENUE *Gains!*

. . . *Modern Meters*


MODERN METER (TYPE J)
LOST REVENUE AREA "A"
"ADEQUATE WIRING" LOADS—1500 WATTS
OLD METER (UNCOMPENSATED)
ADDITIONAL LOST REVENUE AREA "B"
"ADEQUATE WIRING" LOADS—2000 WATTS
PERCENT REGISTRATION
101 100 99 98 97 96 95 94 93 92 91 90 89 88 87 86 85 84 83 82 81
20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400
PERCENT OF RATED LOAD



TYPE JA

TYPE JS

Available in either "A" or "S" mountings, Type J Meters are designed for indoor and outdoor service. Ability to measure accurately loads ranging from a small percentage to 400 percent of the meter's normal full load rating, is an inherent characteristic of the Type J Meter.

PROMOTED by modern educational campaigns, adequate wiring has brought about a higher standard of electrical wiring specifications for American homes, so necessary in accommodating the considerably increased residential loads.

The greater loads from adequately wired homes need modern watthour meters. With modern meters, full revenue is assured. But when measured by an old, uncompensated meter, a 1500 watt load, for instance, can cause a registration loss of 8 percent, (see "Lost Revenue Area A"). This loss may be as great as 16 percent, (see "Lost Revenue Area B"), when this load reaches 2000 watts.

An adequate survey of individual operating properties will indicate where a change to modern meters will be a profitable investment through revenue gains.

COMPANY SPRINGFIELD ILLINOIS

BUSINESS GAINS CONTINUE ALONG WIDE FRONT

The retail merchandising business increased only slightly over 1940 during the first quarter. The major effort, so far, has been by wholesalers and manufacturers upon dealers who have bought heavily both in anticipation of heavy mid-year business and lengthened deliveries. Consumer buying is expected to set new records during the summer and continue throughout the year. Wholesalers report well-assorted business with volume setting new high records and backlog of unbilled orders constantly increasing. Deliveries have not appreciably lengthened, except for floodlights and small staple conduit fittings.

Twelve new ship ways have just been authorized for Los Angeles and the Northwest, with orders for 60 ships distributed among them.

Defense Construction

Two billion dollars of planes and ships are being manufactured in California alone. Recent defense units, apparatus order include three Westinghouse 12,000-kva. transformers, $53,298 for Tacoma; $51,577 for 230-kva. switchyard equipment for Grand Coulee; $278,000 for General Electric miscellaneous equipment for service expansions at Bremerton navy yard; $192,283 for substations and transformers for Fort Lewis near Tacoma; $212,500 for a Star 50-ton drydock crane for Pearl Harbor; two-230-kva. 600-ampere Westinghouse circuit breakers for Grand Coulee, $143,565.

S. Morgan Smith's bid of $342,850 was low for the 40,000-hp. turbine and governor for the Parker Dam plant on Arizona-California border.

Two additional shipways with 4,000 kw. connected loads are being added to a South San Francisco yard. Southern California & Arizona airports have reached the electrical stage and record flood and boundary installations averaging $40,000 including distribution systems, as at Winslow, Tucson, Yuma and Las Vegas.

Varied Orders

Orders of interest include 500,000-ft. 1-in. black pipe for Central Valley at Friant; air heaters for Grand Coulee plant; $24,308 for contact and range lighting for Los Angeles airport; $23,854 General Electric carrier current system for Covington-Bonneville sector; $32,081 Allis-Chalmers circuit breakers for Tacoma. $900,000 for additional machinery, substations and distribution lines for Mare Island Navy Yard including $225,000 for heaviest sizes of varnished cambric cable for drydock wiring and ship connections. Other important orders include: a 12,500-kva. Westinghouse transformer for Vancouver, Wash., station; equipment for two Alaska radio stations, $75,000; electric equipment and generator for San Francisco Presidio; an $817,500 award for 260 dwelling units near Bremerton navy yard. Grand Coulee business $120,000 Corning Glass insulators for Covington transmission line and $133,221 for 115-kv. line between Walla Walla and Lewiston. Westinghouse was awarded $137,489 for generators and appurtenances for Los Angeles harbor steam plant and Burbank has bought $30,000 Kelman circuit breakers. Southern California Edison is buying several carloads of hardware for its Boulder lines and switchyards. Recent Pacific Gas and Electric staple business has included $40,000 street lighting, transformers, cables and standards, and $60,000 step voltage regulators. Various iron and steel companies have recently purchased 22 large General Electric motors valued at $15,000 and $75,000 in switch gear equipment; $18,000 Pyronol transformers at two 300 hp. synchronous motors and switches valued at $30,000.

A recent northern California industry campaign for electric ranges and water heaters produced 2 months' sales of 3,029 and 1370 units respectively, an increase of 300 percent over 1940. Pacific Gas and Electric Co. is waging an all-year campaign in which sales credits are allowed only for installations averaging 50-ft. candles and over.

Transportation Problems

Pacific Coast firms are concerned over gradual withdrawal of intercoastal ships through the Panama Canal, and their requisition by the government for urgent trans-Pacific service. This may presage trans-continental rail shipments, with consequently higher freight charges, and also greater strain upon, and heavier purchasing by, the railroads.

Housing Developments

1,000 projected small homes at Sunnyvale will be constructed at a cost of $750,000; a Los Angeles award of $1,769,521 for 638 dwelling units; a San Francisco award of $823,374; a $750,000 appropriation for San Mateo and Contra Costa Counties, all in California.

Bonneville Budget Gives Spokane a Power Line

Even though Spokane voters turned down municipal distribution of Bonneville-Grand Coulee power, the House of Representatives public power bloc intends to help the city "change its mind." Included in the $22,858,500 appropriation bill for the Bonneville Power Administration passed by the House is an earmarked item of $2,000,000 solely to build a line from Coulee to Spokane, a distance of 78 miles.

The 1941-42 appropriation includes funds for expanding the present 230-kv. transmission network now under construction. Specific items include: $1,730,000 for completing the 185-mile line from Grand Coulee to the Puget Sound region; $1,219,000 for a third 230-kv. line from Bonneville to Vancouver, Wash.; $3,785,000 for a second circuit connecting Bonneville and Grand Coulee and $4,022,900 for substation work at Covington, Seattle, Midway, North Bonneville and Vancouver.

Funds in the amount of $2,716,000 will be available for extensions to the 115-kv. transmission system including a line between St. Johns' substation and Oregon City, two lines from Bonneville to the Alcoa substation, and substation construction at Bonneville, St. Johns and Oregon City. Feeder lines and service connections will take $4,500,000; advance surveys and investigations will receive $500,000; $250,000 goes to permanent buildings, $885,600 to operation and maintenance and $250,000 for power purchases.

THERE ARE "BESTS" IN EVERY INDUSTRY

IN ELECTRICAL APPLIANCES IT'S

Sunbeam

Automatic MIXMASTER
Double Automatic IRONMASTER
SILENT AUTOMATIC TOASTER
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FLAT TOASTER • FAN HEATER
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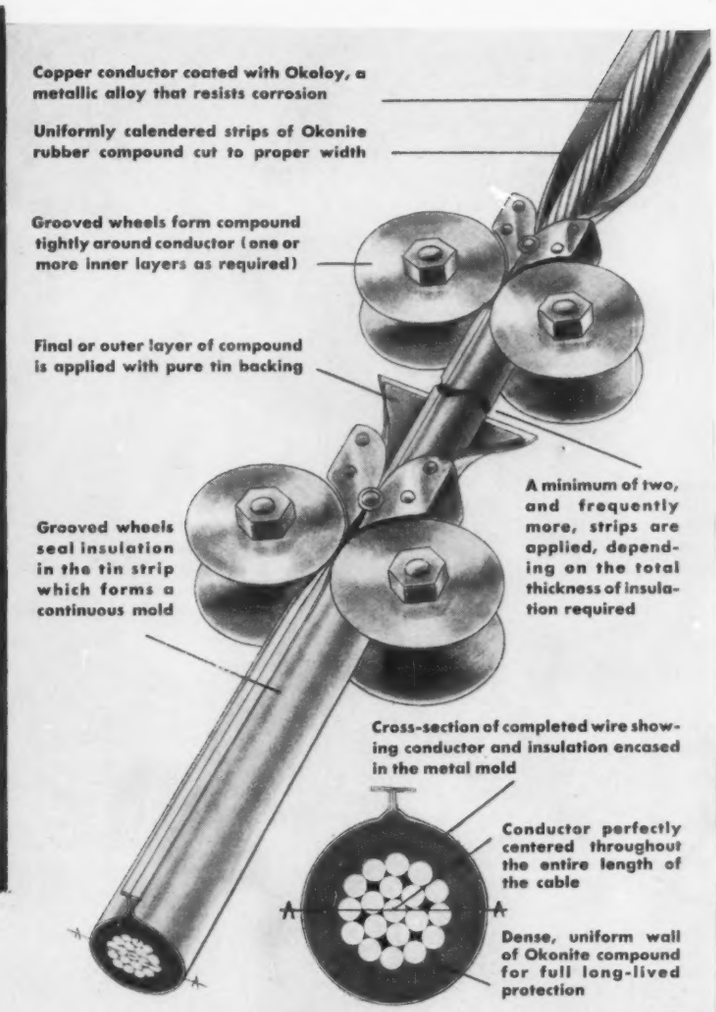
50 YEARS MAKING QUALITY PRODUCTS

OKONITE
Insulation is Applied by This EXCLUSIVE PROCESS

Okonite wires and cables have always been distinguished for long life, exceptional electrical characteristics, high insulation density and perfect centering of conductors.

Of utmost importance to the attainment of these results is Okonite's strip-insulating process by which the insulation is wrapped around the conductor and sealed in a continuous metal mold during vulcanization. For nearly 60 years we have made Okonite insulation this way and for 60 years Okonite has been compiling unequalled records for unfailing performance under severest service conditions.


Copper conductor coated with Okoloy, a metallic alloy that resists corrosion
Uniformly calendered strips of Okonite rubber compound cut to proper width
Grooved wheels form compound tightly around conductor (one or more inner layers as required)
Final or outer layer of compound is applied with pure tin backing
A minimum of two, and frequently more, strips are applied, depending on the total thickness of insulation required
Grooved wheels seal insulation in the tin strip which forms a continuous mold
Cross-section of completed wire showing conductor and insulation encased in the metal mold
Conductor perfectly centered throughout the entire length of the cable
Dense, uniform wall of Okonite compound for full long-lived protection

Vulcanization takes place under high temperature and pressure. The metal mold insures even density and heat distribution
The Single Ridge is the hall-mark of this exclusive method of cable manufacture—LOOK FOR IT
The tin mold is removed after vulcanization and the insulated conductor is ready for a series of complete electrical and mechanical tests before application of coverings

5 FOUNDATIONS OF OKONITE QUALITY

1. Made only with Up-river Fine Para rubber carefully washed and dried
2. The Okonite formula is proved by long use rather than accelerated tests
3. Conductors perfectly centered by the Okonite strip-insulating process
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Okonite's Okoloy coating on conductors eliminates corrosion

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OKONITE Insulated Wires and Cables

Unacal Turbine Oils were developed expressly to reduce these most common causes of lubrication failure.

They are carefully blended and refined to give you protection against breakdowns and reduce maintenance to a minimum.

Unacal Turbine Oils are available in any four grades to suit your turbine, whether steam or water-operated, direct connected or geared. Extra heavy grades are available for high speed, heavy duty Herringbone and Helical Reduction Gears and Kingsbury Thrust Bearings.

UNION OIL COMPANY

Why not start today to get the right kind of lubrication? Switch to Unacal Turbine Oils. They will give long, trouble-free service.

Your nearest Union Oil representative will be glad to supply you with any additional information. Call him today.

FPC CONTINUES HEARING ON UTAH POWER & LIGHT

An FPC hearing focused on original costs of properties acquired by the Utah Power & Light Co. was recessed May 13 after eight days of exhaustive testimony by officials of the Utah utility.

Throughout the hearing, which began May 5, numerous officials of the company were questioned by FPC attorneys on two phases of the original cost question. First phase dealt with an FPC "show cause" order for the company to explain why additional data and records could not be furnished to the commission relative to original cost structures of thirty-nine predecessor companies. Second phase was of an "investigational" nature, pertaining to methods pursued by the utility in preparing a reclassification of cost study for the FPC in 1940. The reclassification survey was based on the FPC order in 1937 which required utilities to base valuations on original cost of predecessor concerns rather than on subsequent or "write-up" methods of accounting.

Contending that the company did not make adequate use of all original cost figures, the commission cross-examined R. H. Jones, treasurer and assistant secretary; J. A. Hale, vice-president; L. A. Seare, assistant treasurer; Ferris R. Thomassen, assistant treasurer and E. F. Heim, budget engineer.

The hearing is subject to re-opening by FPC at 15 days notice.

Western Canada Tries Blackout Practice

Preparations for Canada's largest experimental blackout, which took place simultaneously May 20 in Vancouver, Victoria, Esquimalt, Oak Bay and adjacent municipalities and rural areas, included extensive cooperation and work by the electrical industry.

One item was time-clock-controlled neon signs, of which there are thousands in Vancouver. It was necessary to visit each sign on the morning of the blackout and adjust the clock to the blackout period, and the next day re-adjust to usual sequence. Hospital lights were put out and nurses and orderlies supplied with electric torches.

B. C. Electric Railway Co. blacked out street lamps and workers in substations provided with flashlights to eliminate possible accidents. Illumination of bridges was stopped and all street and bridge traffic stopped for the duration of the blackout which was 20 minutes. Plants engaged in war production were given special permits to operate, but were required to darken all windows and light escapes.

PROPOSAL WOULD SIMPLIFY WIRE SIZES IN CODE

To replace five types of wire with a single new type small diameter wire and simplify the Code, a proposal has been officially presented to the Electrical Committee for an interim revision of Section 3005, tables 1 and 2 and other related sections of the 1940 Edition of the National Electrical Code, by George Andrae, chairman of the codes and standard committee of National Electrical Contractors' Assn. This important revision will be considered at a meeting of the Electrical Committee June 10 at Chicago. To this meeting from the West will go the new president, George W. Kimball, San Francisco, R. H. Manahan, Los Angeles, Ben C. Hill, Oakland, and G. E. Price, Orange Co., from California and F. D. Weber, and L. W. Going of Portland and W. L. Gaffney, first vice president, Tacoma. Ralph W. Wiley, San Francisco, and C. M. Kirsop of Olympia are representatives from the U. S. Conference of Mayors.

The proposed revision would eliminate from the 1940 Code type R, RP, RPT, RH and RHT wires and would replace them with a single new type R suitable for operation at maximum ambient temperature of 30° C, 86° F. The 1937 Code current carrying capacities would be ascribed to the new wire when not used for continuous loads. It will have a thinner but a superior rubber insulating compound. Types RU and SN would remain as at present but extended in use to both new as well as old work and to include No. 6. Maximum standard wire sizes would be limited to 500,000 cir. mil.

Correlation of this simplification in all of its phases is included in the proposal for revision. The proposal would produce a smaller diameter all-purpose wire, eliminate duplicate supplies, stocks and inventories, remove confusion in regard to applications and simplify tables and calculations and would also simplify the range of sizes of wire. Response to this proposal already has been enthusiastic because the 1940 Code wire provision has been holding back a general acceptance of the entire Code throughout the West.

● RENEWAL of the combination resale and stand-by service contract with the Utah Power & Light Co., which expired May 1, was rejected by the Provo, Utah municipal plant officials and Mayor Mark Anderson. However, the city commission has approved a three-months' contract to provide standby service until the third unit of the city plan is completed sometime in July.

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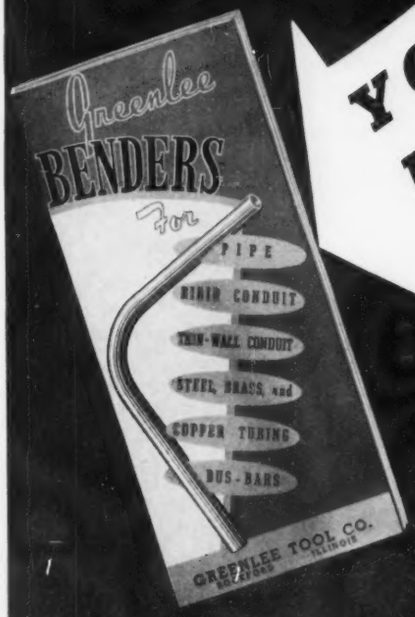

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- THIN-WALL CONDUIT
- PIPE
- TUBING
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DUNSMUIR — AGAIN

Earle Dunsmuir, head of the Dunsmuir Electric, west Broadway, Vancouver, B. C., has been re-elected as president of the Vancouver Electrical Assn. Dunsmuir arose to this office last year after a number of years service as vice-president, treasurer and as a director of the association. George Firth, vice-president of the association, who has retired on account of ill health, was succeeded in that office by J. Carmichael, while J. Homersham, of Homersham Electric, was returned to office as secretary and R. Sutherland was elected treasurer.

B. Graham, C. Longley and R. Beaumont were elected as directors for two years while J. Holt and E. Crosby were elected as directors for one year. E. Wallace, R. Hall and J. Barwood, who were elected for a two-year term last year, will continue on the directorate for another year.

● A. F. HOCKENSMITH of Los Angeles has been appointed southern California representative for Appleton Rubber Co. tapes.

TURNBULL PROMOTED

Ray R. Turnbull, first vice-president of the Hotpoint company since March, 1940, has been elected executive vice-president at the annual meeting of the board of directors. He was vice-president in charge of sales from 1931 to 1940.

Probably one of the best known men in the appliance business, Turnbull began his career in 1909 as a salesman for the Southern California Edison Co. The following year he joined the Pacific Electric Heating Co. at Ontario, Calif., which made the original line of Hotpoint appliances. When the present

TURNBULL

Hotpoint organization was formed in 1918, he became sales representative for the Pacific Northwest and later district manager. In 1924 he was made Pacific Coast district manager and a few years later went to the Chicago headquarters. His entire career, except for a brief period with the General Electric appliance organization in Bridgeport, has been with Hotpoint. During the last world war he was a lieutenant in the air corps.

Others elected included J. C. Sharp as vice-president in charge of engineering and I. A. Rose as vice-president in charge of manufacturing.

● A. N. Kemp, member of the board of directors of the Southern California Edison Co., has been elected a director of American Airlines, Inc. Mr. Kemp also is a director of the California Bank, a regional member of the New York Stock Exchange arbitration committee, and president of the Pacific Mutual Life Insurance Co.

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Seven leagues ahead in engineering, construction and planned production, too. As a result Thermador products in a steady stream are moving out of this busy efficient plant—on schedule, to our old customers. With an ever increasing demand—an ever decreasing supply of materials we suggest that you look ahead to tomorrows needs and order today!
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A complete line of round and square models in sizes from 8 to 126 gallons
ELECTRIC SPACE HEATERS
Built in and portable models for every home and every need
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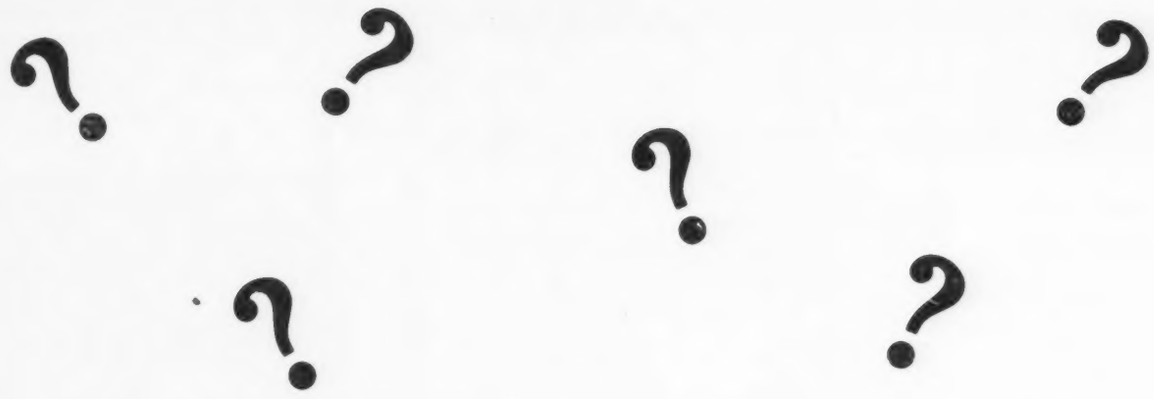
Factories: 5119 So. Riverside Drive, Los Angeles, Calif.; 3rd and Madison Streets, Oakland, Calif.
Sales Offices: 177 Harris Street, N. W., Atlanta, Georgia; 448 West Madison Street, Phoenix, Arizona; Builders' Exchange, Fresno, California



ARE *WE* PREPARED?

It's total war, with no appeasement, and we might as well tighten our belts, strengthen our defenses, and plan our attacks with the keenest tactical knowledge we can acquire. We're in it up to our necks, it's a scrap that will probably last many years, and upon its outcome will depend our economic welfare — our standards of living. So let's face the issue—are we prepared?

Oh, gosh no! We're not talking about the European mess, or the Oriental situation—**we mean the fight right here at home, the battle between industries for the customer's dollar.** Now, there's a war! The enemy is at our borders ready for a blitzkrieg invasion at our first sign of weakness. He's invaded before—on some fronts we've driven him back, on others we've lost some territory. But it is a constant and continuous battle.

Just as in National Defense, where coordination and cooperation were found to be the first essentials to real accomplishment, an industry must coordinate its efforts, and all units must cooperate if it is to give a creditable account of itself in the Battle for Business.

G.H.Q. for the electrical industry in this area is the P.C.E.A. So, give your red corpuscles a break—line up and sign up! Enlist—don't wait to be drafted.

PACIFIC COAST ELECTRICAL ASSOCIATION, Inc.

447 SUTTER ST., SAN FRANCISCO **601 W. FIFTH ST., LOS ANGELES**

SMOOT-HOLMAN COMPANY
Pioneers of Lighting in the West

LUMINAIRES
REFLECTORS
SIGHT-CRAFT
FLUORESCENTS
FLOODLIGHTS

INDUSTRIAL AND COMMERCIAL LIGHTING EQUIPMENT
HOME OFFICE AND FACTORY . . . INGLEWOOD, CALIFORNIA

WAREHOUSES
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315 Crawford Street

FRED ZAUGG
630 N.W. 10th Ave.,
Portland, Ore.
COAST SALES CO.
307 Main St.,
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STEVENS SALES CO.
41 Post Office Place,
Salt Lake City, Utah
G. S. SPANGLER
618 Colorado Bldg.,
Denver, Colo.

G.C.A.
Lamp Replacers
Lamp Base
Removers
Cartridge Fuse
Tongs
Switch Hooks
Send for Catalogue
We have been making safety tools for 24 years
THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

LEW FLOOR BOXES
Give You Greatest Flexibility in Floor Box Applications

A floor outlet for any type of floor construction.

LEW Floor Boxes and Fittings manufactured since 1930 are credited with being the finest made.

A TRIAL WILL CONVINCE YOU
Complete stock carried in Western Warehouse
CALL or WRITE

Walter E. Brand Co.
1855 Industrial St., Los Angeles, Calif.
Lew Fittings Co.
630 W. Jackson Blvd., Chicago, Ill.

"WHAT CAN IT DO FOR ME?"
Advertising that is read with this thought in mind, may provide the solution to a problem that has kept you awake nights.
We all know "It Pays To Advertise." It pays just as big to investigate WHAT IS ADVERTISED—every month in
ELECTRICAL WEST

TRADE MARK REG. U.S. PAT. OFF.
Nichrome
Made only by **DRIVER-HARRIS COMPANY**

Stocked for the Coast Trade at

SAN FRANCISCO
235-241 San Bruno Ave.
LOS ANGELES
449 South San Pedro St.
SEATTLE
2122 Fourth Ave.

By
ANGUS-CAMPBELL, INC.

● A. V. THOMPSON, prominent for many years in Pacific Coast electrical industries, and recently utilities division manager of the Golden Gate International exposition, has been appointed to

THOMPSON

the staff of California Electric Supply Co., San Francisco. Prior to the Exposition, Thompson was special representative of A. F. Dickerson of General Electric Illuminating Laboratories, Schenectady, N. Y.

● R. E. FISHER, Pacific Gas and Electric vice-president in charge of public relations and sales, headed the successful 1941 Red Cross roll call in San Francisco.

● PRESTON L. ADAMS of Wenatchee, Wash., has been appointed consulting engineer for the Clearwater Valley Light & Power Assn. and will begin work immediately, it is stated, on the newest REA allottment in preparation for construction. Adams replaces T. C. Smith, who resigned to accept a position with Bonneville Power Administration. The Clearwater Association's allottment granted three months ago, calls for expenditure of $128,000 for extension of primary lines.

● FRANK MCLAUGHLIN, president of the Puget Sound Power & Light Co., has been appointed regional vice-president of the Navy League of the United States. For the past seven years McLaughlin has been state chairman of Navy Day, and for two years, he has been a member of the national board of the Navy League.

● WALTER C. HESTON has been appointed acting manager of the Northern California Electrical Bureau during the absence of Major Geo. W. Barker, on active service with the U. S. Army Quartermaster Corps at Hoff General Hospital, Santa Barbara.

ALWAYS READY-
READY NOW!

(Reading Time: 1 Minute, 15 Seconds)

Expanding National Defense requirements in the Pacific Northwest have created an unprecedented need for electric power. Although this abnormal demand is superimposed on normal peace time requirements, the private electric light and power industry is ready to handle its share.

Such preparedness is not a hastily erected bulwark. Since electricity was first harnessed for use in the territory over 50 years ago, the private electric light and power companies have foreseen constantly changing conditions and measured up to their obligations to supply adequate electric power to the region. Much of the wealth and high standard of living in the Northwest—much of its population growth and economic stability—is due to the pioneering spirit, foresight and planning of the private electric light and power industry.

Pioneering in hydro development, in long distance transmission, in interconnection, the private power companies have brought a quality of service to the people of the Northwest unsurpassed in this country for adequacy, dependability and mobility.

Adventuring into uncharted economic ground—gambling on the future—by building rural lines into thinly populated farming areas, they have paved the way for rural growth, and have contributed much to agricultural prosperity.

Experimenting with the then new and untried promotional type of rate, and trying out unorthodox methods of appliance merchandising and promotion, they brought great benefits to thousands of housewives in the form of relief from drudgery through the use of electrical household servants at the lowest rates of any region of comparable size in the nation.

All this has been accomplished under the long accepted American system of free enterprise, asking no subsidy and meeting its growing share of the mounting cost of government.

There is no reason to change. The private power industry has always been ready. It is ready now.

NORTHWEST ELECTRIC LIGHT and POWER ASSOCIATION

707 SPALDING BUILDING **PORTLAND, OREGON**

● CHANGES in sales personnel of Idaho Power Co. announced by R. E. Gale include: R. S. Overstreet, division sales manager in the Boise division for the past ten years, will become assistant general sales manager. Previous to becoming division sales manager, Overstreet had been engaged in rural sales promotion for the company. R. A. Hogg will become division sales manager, and W. S. Janssen, residential salesman, will be moved to supervisor. F. M. Ingraham goes from the general office in Boise to become division sales manager at Twin Falls. A. S. Gilbert, present Twin Falls division sales manager, will be transferred to the general office in Boise as sales promotion manager in the place of E. A. Olson who will head the residential and farm sales division in the general office sales department.

● A. H. KITSON, sales manager, electric range division of Norge, made a special trip to the Pacific Coast early in May to coordinate his company's interests with the range campaigns in progress in that region.

● J. J. ANDREWS has been named agricultural representative of the B. C. Electric Railway Co., succeeding George Challenger, who has been appointed district manager for the Fraser Valley.

Expanded Facilities at Your Service!

To provide better service for our customers, we have completed a new factory addition which contains an assembly production line, new engineering and drafting offices, and additional storage space. Increased production of high quality GARDNER Transformers is assured by the installation of new machinery, including a large electric, automatically controlled baking oven.

You are invited to inspect these new facilities which will provide quicker, more efficient handling of your transformer requirements than ever before.

Above: Hollis Street Frontage — showing front of building which now extends from Hollis to Holden Street.

Gardner Electric Mfg. Co.

4227 Hollis St. Emeryville, Calif.

Represented by

MAYDWELL & HARTZELL

INCORPORATED

SAN FRANCISCO — LOS ANGELES — PHOENIX — PORTLAND

At right: Holden Street Frontage—showing new factory addition with spur track and loading facilities for heavy equipment

● L. C. MOORE, for 10 years rural service supervisor for Portland General Electric Co., Portland, left that company May 17 to devote his entire time to the S & M Flying Service, of which he is part owner. The S & M Flying Service has been awarded a government contract to teach and train aviation recruits. Ben W. Faber, a graduate in electrical engineering from Oregon State College, and for the past six years rural sales representative at Hillsboro, Ore., for Portland General Electric Co. succeeds Mr. Moore as rural sales supervisor with headquarters in Portland.

● R. E. BAXTER, affiliated with the Vance Electric Service Co., has been appointed deputy electrical inspector of Salt Lake City. Baxter replaces James R. Tregeagle, who died May 7 in a Salt Lake hospital of a heart ailment. Tregeagle had held the position for four years.

● RALPH MILLSAP, advertising manager of Portland General Electric Co., has been ordered to take a special course in communications at the U. S. Naval Academy. He is an ensign in the naval reserve. Melvin Arnold, for the past six years a member of Joseph R. Gerber Co., PGE's advertising agency, will become advertising manager. Arnold was active in preparing PGE's advertising during the 1940 PUD campaign.

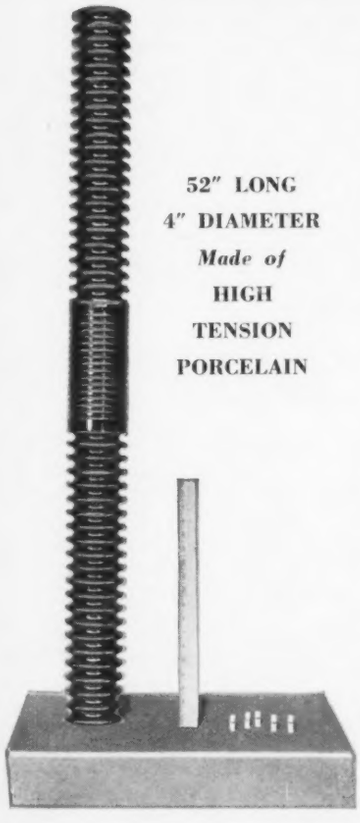
● T. L. ROSENBERG, representing northern California and J. O. Case, representing southern California, have been appointed on the examination committee of the California state contractors license board by chairman Roy Butcher to prepare examination procedure for applicants for electrical contracting licenses in that state. Rosenberg, head of T. L. Rosenberg Electric Co., Oakland, is a member of the Oakland city examining board, as J. O. Case, president of Quality Electric Co., Los Angeles, is of the Los Angeles County board.

DEATHS

● J. FRANCES EMANS, practicing attorney and member of the investment department of the Southern California Edison Co., died suddenly May 27 at her home in Los Angeles. One of Los Angeles' foremost women lawyers, Miss Emans was a member of the California State Bar and last October was admitted to practice before the Supreme Court in Washington, D. C. She had been in the employ of the Edison Co. for 21 years, and was nationally prominent in activities of the Business and Professional Women's Club.

Flexibility of FACILITIES.....

ILLINOIS EQUIPPED TO MEET CUSTOMERS' PORCELAIN NEEDS FROM SMALLEST TO LARGEST SIZES . . .



52" LONG
4" DIAMETER
Made of
HIGH
TENSION
PORCELAIN

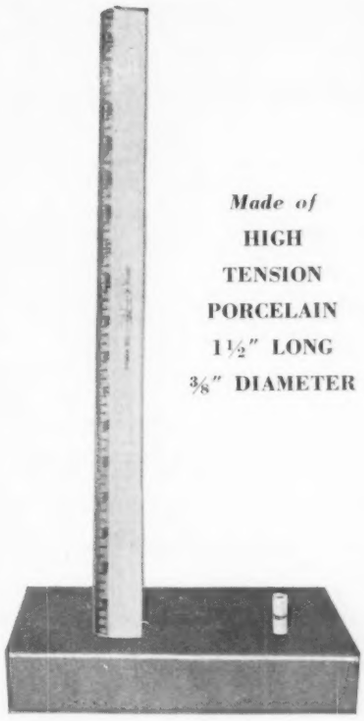
The Illinois plant is so flexible—so modernly equipped—so well organized that no porcelain piece is too small for us to make, and none too large to undertake.

The two illustrations featured here show just how able is this organization to produce the extremes in size.

Illinois handles and ships your orders promptly so that your own production schedules never suffer. Illinois is geared for speed as well as quality.

Plus this, you are always sure of high dielectric strength — high mechanical strength, and exact dimensions. Fine appearance is a part of Illinois Electric Porcelain Products in the smallest and the largest sizes.

Put your porcelain problems up to Illinois—Send for latest Catalog!



Made of
HIGH
TENSION
PORCELAIN
1½" LONG
⅜" DIAMETER

ILLINOIS
REPRESENTATIVES
WILL GLADLY
COOPERATE
WITH YOU

Standardize on

ILLINOIS

FOR TOP QUALITY AND EXACT DIMENSIONS——

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS

TORK CLOCKS

THE POPULAR TIME SWITCH LINE KNOWN EVERYWHERE

NOW—lower prices and higher capacities

There is a Tork Clock for every regular switching job; 60 minute, 4 hour or daily cycles.

Bulletins on request

THE TORK CLOCK CO., Inc.
MOUNT VERNON, N. Y.

Western Representatives:
A. R. Slimmon, 445 E. 3rd St., Los Angeles
Geo. H. Curtiss, 540 McAllister St., S. F.
H. M. Sayers, 1019 Eastlake Ave., Seattle
Stevens Sales Co., 41 P.O. Place, Salt Lake City
Felix Simon, P. O. Box 614 . . . . . Denver
H. Geo. Shefler, P. O. Box 1587 . . . Phoenix

HELWIG Company

QUALITY CARBON BRUSHES
for
MOTORS AND GENERATORS

Catalogs on request
Stocked at:

San Francisco, Calif. 1138 Howard St. Market 7626
Portland, Ore. 305 N.W. 12th Ave. Broadway 0471
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GEO. E. HONN CO.

420 Market St. San Francisco, Calif.

Manufacturers' Representative for

PYREX INSULATORS
S & C PROTECTIVE DEVICES
CORNELL-DUBILIER CAPACITORS
KELLEMS CABLE GRIPS
BLACKBURN CONNECTORS
COLUMBIA TONG TEST AMMETERS
—LOW VOLTAGE GENERATORS
BARTLETT TREE TRIMMING EQUIPMENT
METER JEWELS
BIERCE CONE ANCHORS
—GUY WIRE GUARDS

ELECTRICAL TESTING LABORATORIES

Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory.

2 East End Ave. New York

TRADE *notes*

POLE COMPANY SOLD

Weyerhaeuser Pole Co.'s interests at Ahsahka have been sold to the B. J. Carney Co. C. L. Billings, vice president and general manager of Potlatch Forests, Inc., who is also president of the Weyerhaeuser Pole Co., and Milo P. Flannery, president of B. J. Carney & Co., signed the agreement. Disposal of the cedar poles on hand as of July 1, 1941, equipment in the yards and a longtime agreement extending over a period of years for Potlatch Forests, Inc., to provide cedar poles stumpage to B. J. Carney & Co., were included in the transaction.

The Weyerhaeuser Pole Co., which has been in operation for the past 6 years, will continue to operate the yard at Ahsahka until July 1.

Coincident with word of the sale, it was announced that A. D. Decker, since 1935 western manager of Weyerhaeuser Pole Co. and who has been identified with the Potlatch organization since 1918, will go with Flannery in the Carney Co. Walter Weisman, who in addition to his duties with the Weyerhaeuser Pole Co., is traffic manager for Potlatch Forests, Inc., and J. C. Parker, superintendent of the cedar pole production and plant operations, and who is also log buyer for Potlatch Forests, Inc., both will remain with the latter company.

JARVIS-FIRTH

William Beck and E. A. Palmer have now taken over the business of the Jarvis-Firth Electric Co., 318 Homer St., at Vancouver. The Jarvis-Firth represents the amalgamation of the old established firm of the Jarvis Electric and the young but rapidly expanding business of the Firth Electric about three years ago.

Beck has been associated with the Jarvis Electric for 20 years in the capacity of foreman in charge of contracting work, while Palmer for twelve years has been office and business manager. With the amalgamation of the Jarvis and the Firth organizations they both became partners in the new firm and continued in their former positions.

Firth is now retiring from executive operation of the business although he will continue with the firm on some out of town work. In future the firm will be known by its former name of the Jarvis Electric Co.

H. H. Hughes of Spokane, bidding $2371, secured the contract for the installation of modern overhead lighting system in the business district at Clarkston, Wash.

● NEW MAN at Westinghouse Electric & Mfg. Co. at Salt Lake City is W. L. Moates, who occupies the position of sales assistant to Frank E. Bodine. A native of Idaho, he was formerly at Westinghouse Pittsburgh offices.

● NEW APPLIANCE DEALERS of Salt Lake City are the Economy Appliance Co., Kelvinator retailer, at 131 East 2nd South, managed by W. Layton Barlow; R. S. Powell Appliance Co., Frigidaire dealer, Walker Bank Building, owned and operated by R. S. Powell; and White Distributing Co., new Westinghouse dealer at 3298 Highland Drive, managed by Verdi R. White.

● CLIMATICALLY, San Francisco has been considered a meager prospect for air conditioning because of the general evenness of its temperature and humidity. However, faith in its market possibilities is expressed in the opening of a branch of the General Air Conditioning Co., of Sacramento, in the Rialto Bldg., San Francisco. Orlan Kindorf, manager, recently announced this unusual branching out.

MOVED...

Cache Valley Electric Co., Logan, Utah, from 27 North Main St., to larger quarters at 322 North Main St.

Maycock Appliance Co. from 51 North University Ave., Provo, Utah, to new office and showrooms at 204 West Center St.

Economy Appliance Co. moved from 4431 Crenshaw to 4349 Crenshaw Blvd., Los Angeles.

CHICAGO FLEXIBLE SHAFT CO. moved from 316 Commercial St., Los Angeles, to 737 South Hope St. in that city.

Minnequa Electric Co. moved from 705 South Union to 105 Colorado St., Pueblo, Colo.

H. & H. Electric Co. moved to 1308—8th St., Los Angeles.

Quality Electric Motor Co., San Francisco, moved a block from 967 Howard to 1051 Howard St.

Electric Agencies, Inc., manufacturer's representative in northern California and Nevada for Enamelled Metals Co., Circle Wire & Cable Corp., Briegel Fittings, and Electrical Fittings Corp., have moved their sales office to 198 Georgia, San Francisco, where both sales office and warehouse are combined. Wallace D. Barnes is in charge.

In these critical hours of the national emergency, it is our proud privilege to assign the extensive engineering and manufacturing resources of this company to the hydroelectric utilities of the West . . . thus to collaborate with their efforts to furnish adequate power service for the national defense.

The Pelton Water Wheel Company

Hydraulic Engineers

120 BROADWAY
NEW YORK

2929 NINETEENTH ST.
SAN FRANCISCO

PASCHALL STATION
PHILADELPHIA

EXCLUSIVE WESTERN REPRESENTATIVES for Baldwin-Southwark Division of Baldwin Locomotive Works, Baldwin De LaVergne Sales Corp., Woodward Governor Co., Cone Valve Division, Chapman Mfg. Co., and Carbondale Division, Worthington Pump & Machinery Corp.

BLW
THE BALDWIN GROUP

PELTON

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

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PROFILES *of the month*

IES conferees from all regions, above, included Walter Potter, Alston Rodgers, both of G-E Lamp Department, Portland and Los Angeles, C. T. Bakeman, Puget Sound P&L, Seattle, and Dr. Leland H. Brown, Stanford University

Below is R. C. Lagerstrom, new General Electric Lamp Dept. engineer, Oakland, who is serving while S. H. Hazleton, jr., is in active service as Signal Corps Lieutenant at Fort Lewis, Wash. Lagerstrom told of new lamps at the IES

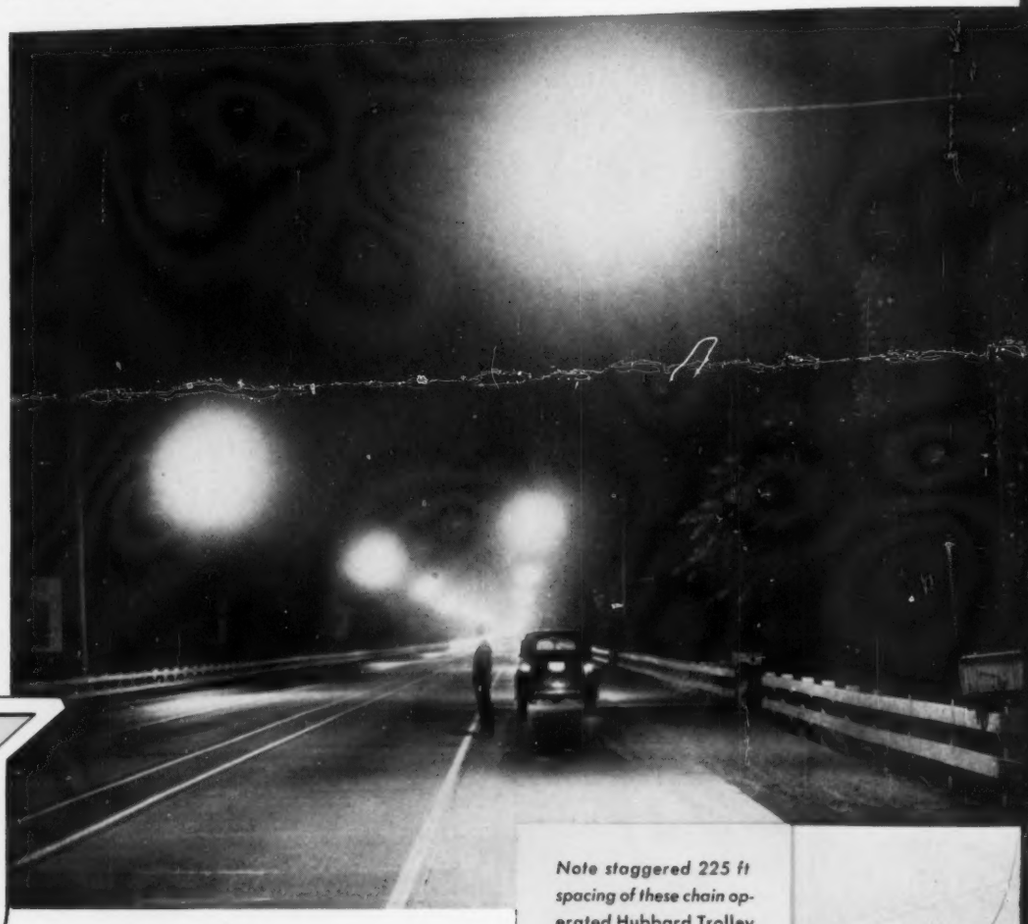
Carl Heise, above, veteran Westinghouse manager and industry representative, as he was given a testimonial dinner on his retirement by the San Francisco Electric Club

Below, left, is R. W. Hurff, new managing director of Electric Appliance Society of Northern California, former PG and E man

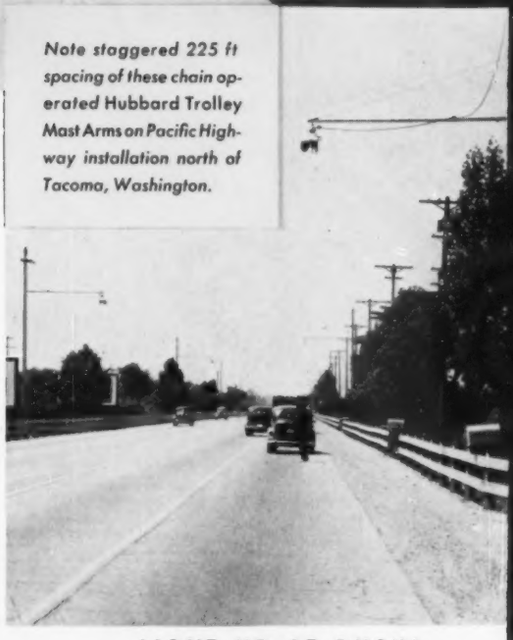
At right, below, is genial D. J. McGonigle, general sales manager, Montana Power Co., who heads the Business Development Section for the next year for Northwest EL & P Assn.

IT TAKES A MIGHTY ARM*
TO HOLD THE LIGHT THAT LIGHTS THE WAY

KEEP OUR HIGHWAYS FREE from Traffic Deaths!



Note staggered 225 ft spacing of these chain operated Hubbard Trolley *Mast Arms on Pacific Highway installation north of Tacoma, Washington.*



★ HUBBARD TROLLEY MAST ARMS for Street and Highway Lighting

The 10,000 foot-candles of light supplied during the day by the sun become but a fraction of 1 foot-candle after the sun goes down. That's why state laws require motorists to drive with headlights from one-half hour after sunset to one-half hour before sunrise. However, the ordinary headlamp will provide only about 200 feet of visibility on clear nights—half that on wet and foggy nights. When you stop to consider that it takes but 2½ seconds for a car traveling at 50 miles per hour to cover this distance of 200 feet, the need for adequate lighting on highways and streets becomes clearly self-evident. Lives depend on lights—and lights depend on Hubbard Trolley Mast Arms.

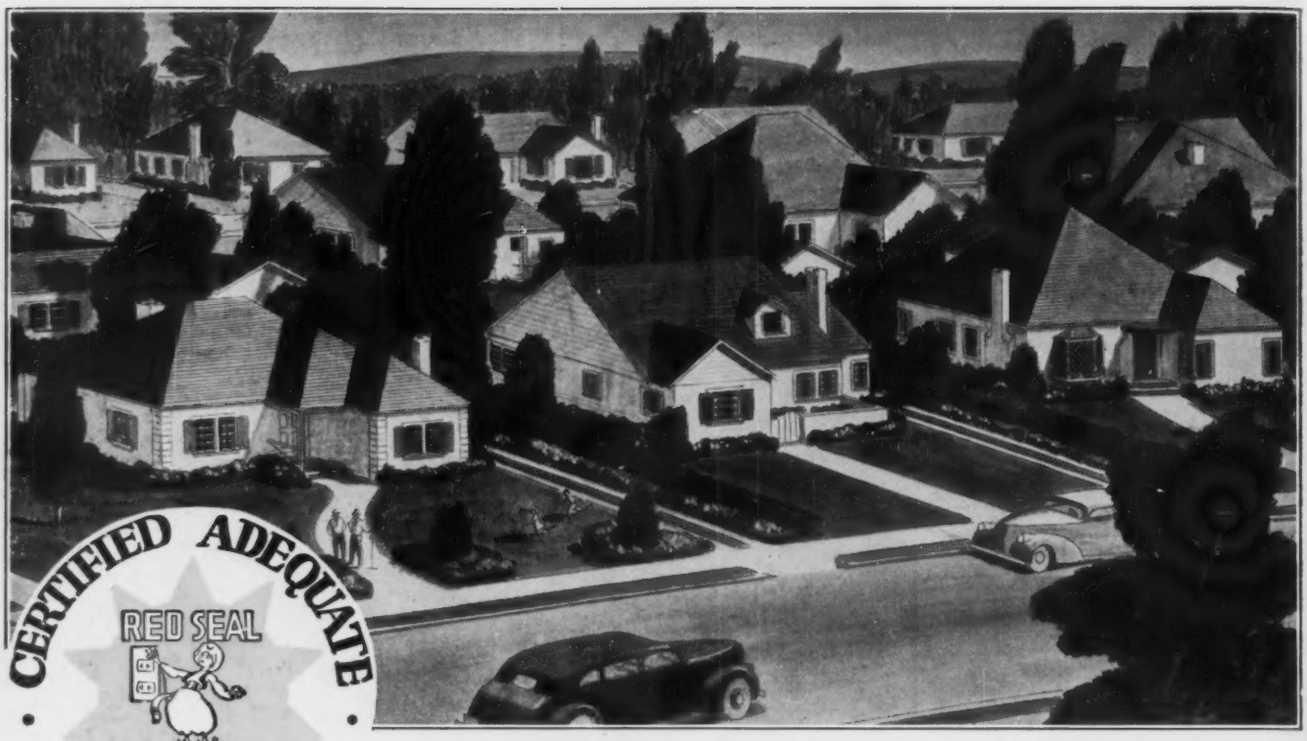
Hubbard Trolley Mast Arms (patented) have many exclusive and outstanding features. They operate by means of a continuous pre-stretched bronze chain protectively encased in the No. 12 gauge steel arm housing. Rod and thumb screw adjusts chain tension. Arms available in 6 ft., 8 ft., 10 ft., 12 ft., 14 ft., and 16 ft. lengths. Before you specify or buy any Mast Arms, write us for complete details.

NEW SWIVEL YOKE LEVELING ADJUSTMENT
As an integral part of the trolley carriage this *new swivel* yoke now permits light to be leveled or adjusted to any desired angle.

LIGHT UP AT DUSK!

Hubbard and COMPANY
OAKLAND, CAL. PITTSBURGH CHICAGO

HANG THE LOAD ON HUBBARD HARDWARE



THE WIRES GO ROUND AND ROUND AND COME OUT HERE!

Your future, and the future of everyone else in the electrical industry lies in just such homes as these.

If each new home is adequately wired at the time it is built, it is a potential customer for electrical equipment, both new and replacement, and a customer for increasing electrical service for the life of the building.

But—if we neglect to sell the idea of adequate wiring—every new home that is inadequately wired will be padlocked against additional appliances.

Thousands of homes are in the planning stage right now. It is up to this industry—up to you—to see that adequate wiring is included in those plans.

Some of these houses are going up in YOUR territory. Your future depends upon the kind of wiring that goes into them.

Make every effort to reach the owners and builders RIGHT NOW. Tell the adequate wiring story at every opportunity—talk, write, wire, advertise and publicize ADEQUATE WIRING.

PACIFIC COAST *Electrical* BUREAU

447 SUTTER STREET, SAN FRANCISCO • 601 WEST 5TH STREET, LOS ANGELES